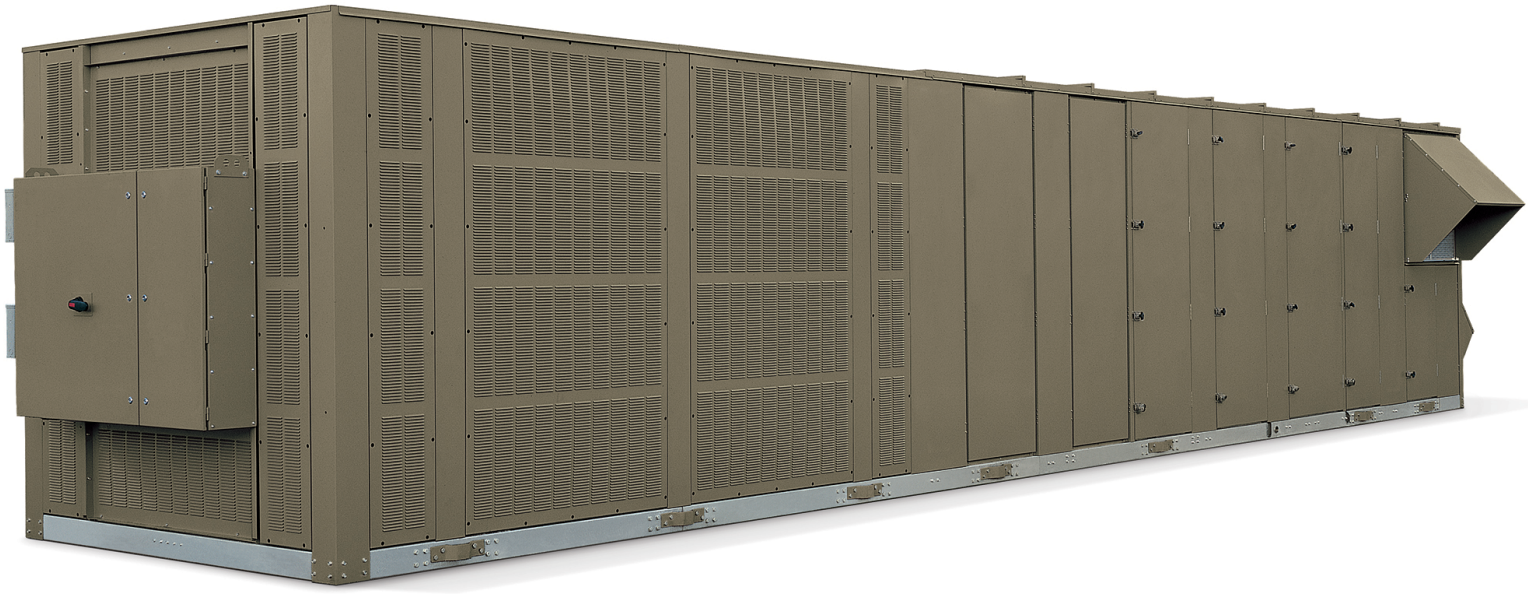
YPAL 70 Ton to 105 Ton Single Packaged Rooftop Units, Mod G, Installation, Operation, and Maintenance Manual



Installation Guide

Issue Date: 2021-04-07

Form Number: YRK2-NOM1 (421)

Supersedes: YRK2-NOM1 (120)

INSTALL CONFIDENCE.

Contents

General safety guidelines

This equipment is a relatively complicated apparatus. During rigging, installation, operation, maintenance, or service, individuals may be exposed to certain components or conditions including, but not limited to: heavy objects, refrigerants, materials under pressure, rotating components, and both high and low voltage. Each of these items has the potential, if misused or handled improperly, to cause bodily injury or death. It is the obligation and responsibility of rigging, installation, and operating/service personnel to identify and recognize these inherent hazards, protect themselves, and proceed safely in completing their tasks. Failure to comply with any of these requirements could result in serious damage to the equipment and the property in which it is situated, as well as severe personal injury or death to themselves and others at the site.

This document is intended for use by owner-authorized rigging, installation, and operating/service personnel. It is expected that these individuals possess independent training that will enable them to perform their assigned tasks properly and safely. It is essential that, prior to performing any task on this equipment, this individual shall have read and understood the on-product labels, this document and any referenced materials. This individual shall also be familiar with and comply with all applicable industry and governmental standards and regulations pertaining to the task in question.

Important!

Read before proceeding!

Safety symbols

The following symbols are used in this document to alert the reader to specific situations:

DANGER

Indicates a possible hazardous situation which will result in death or serious injury if proper care is not taken.

WARNING

Indicates a potentially hazardous situation which will result in possible injuries or damage to equipment if proper care is not taken.

CAUTION

Identifies a hazard which could lead to damage to the machine, damage to other equipment and/or environmental pollution if proper care is not taken or instructions and are not followed.

Note: Highlights additional information useful to the technician in completing the work being performed properly.

⚠ WARNING

External wiring, unless specified as an optional connection in the manufacturer's product line, is not to be connected inside the control cabinet. Devices such as relays, switches, transducers and controls and any external wiring must not be installed inside the micro panel. All wiring must be in accordance with YORK's published specifications and must be performed only by a qualified electrician. YORK will NOT be responsible for damage/problems resulting from improper connections to the controls or application of improper control signals. Failure to follow this warning will void the manufacturer's warranty and cause serious damage to property or personal injury.

⚠ WARNING

Cancer and Reproductive Harm –– http://www.P65Warnings.ca.gov .

Changeability of this document

In complying with the YORK policy for continuous product improvement, the information contained in this document is subject to change without notice. YORK makes no commitment to update or provide current information automatically to the manual or product owner. Updated manuals, if applicable, can be obtained by contacting the nearest YORK Service office.

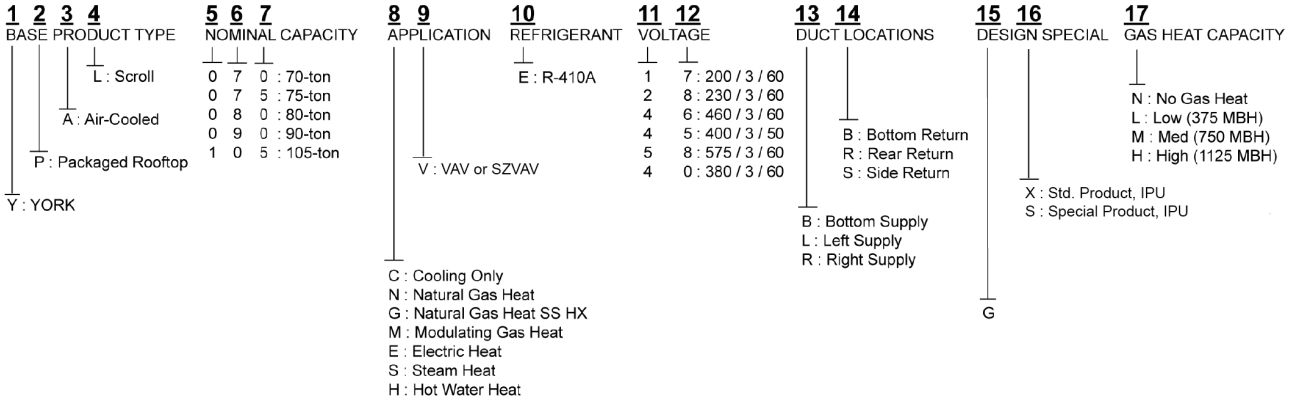
It is the responsibility of rigging, lifting, and operating/ service personnel to verify the applicability of these documents to the equipment. If there is any question regarding the applicability of these documents, rigging, lifting, and operating/service personnel should verify whether the equipment has been modified and if current literature is available from the owner of the equipment prior to performing any work on the equipment.

Revision notes

Associated literature

Manual description	Form number
Static Pressure Probe 50-65 and 70-105 Ton, Mod F, 120-150 Ton, Mod G Installation Instructions	YRK-N1
High Altitude Accessory Kit Single Packaged RTU Mod D through Mod G 50-150 Ton Installation Instructions	YRK-N2
YORK 50 Ton to 150 Ton Rooftop Unit Start-Up Guide	YRK-SU1
Control Sequences Start-Up Guide	YRK-SU2

Figure 1: Base model number



Introduction

Ecological and economical design

First packaged rooftop unit with R-410A optimized design.

Cooling and heating

Superior operating performance provides lower operating costs. Smaller steps of cooling capacity provide tighter control of building environment and occupant comfort while optimizing energy efficiency.

IAQ

Outside air economizers provide energy savings in free cooling mode, and can provide a healthier and more comfortable building environment by introducing fresh outside air into the building as needed. Indoor air quality (IAQ) requirements for building ventilation and comfort are controlled through the microprocessor control panel. Optional airflow measurement provides an accurate means of tracking air quality and alerting the occupants or building owner to unhealthy situations.

High-efficiency motors

High-efficiency motors are available for optimum energy efficiency. All motors used on the Packaged Rooftop air conditioner meet U.S. EPACT 1992 minimum requirements.

Modulating gas heat

Fully modulating gas heat and greater steps of capacity control offer superior off-design performance while maintaining optimum occupant comfort.

Condensing section

Scroll compressors

Reliable, efficient, trouble-free operation is the true measure of a packaged rooftop's value. That is why the Packaged Rooftop air conditioners use established scroll-compressor technology to deliver dependable, economical performance in a wide range of applications. With the Packaged Rooftop Unit, you get the latest generation of compressor enhancements added to the scroll's inherent strengths. The simplicity of a hermetic scroll compressor allows the use of fewer moving parts to minimize breakdown.

Multiple compressor staging

Through the use of the scroll compressor, the rooftop unit has the ability to stage its cooling by enabling and disabling multiple single stage compressors on multiple circuits. These compressors are manifolded together in three independent circuits.

Figure 2: Packaged rooftop air conditioning unit

Compressor circuiting

The rooftop is designed so that only two scroll compressors are in tandem within one refrigeration circuit. This means more reliable compressors, and less equipment down time. With multiple circuits, if a compressor should ever fail on one circuit, the other circuit(s) remain operational to work to maintain occupied loads. The Packaged Rooftop Unit system has two or three circuits in the unit depending on the size.

Compressor sound blankets

Optional factory installed sound blankets can be installed to further reduce compressor sound attenuation.

Replaceable core filter driers

The optional replaceable core filter driers provide a convenient means for maintaining and optimizing the unit's refrigeration system. Eliminating additional field penetrations into the refrigerant circuit, which could lead to potential problems, reduce the worry of refrigerant circuit contamination.

Low ambient operation

Head-pressure control is accomplished via a VFD motor controller rather than an inefficient and noisy condenser fan damper. By varying the speed of the condenser fan, better control and quieter operation is obtained during the colder months. Low ambient controls are available on all systems offering higher rooftop cooling capacity than competitive units.

Condenser fan motors

The condenser fan motors used on the Packaged Rooftop Unit are totally enclosed air over (TEAO) to provide maximum durability through any season.

Coils

Condenser coils are microchannel type and made of a single material to avoid galvanic corrosion due to dissimilar metals. Coils and headers are brazed as one piece. Integral sub cooling is included. The design working pressure of the coil is 650 PSIG (45 bar).

Condenser coil protection

The rooftop unit is available with either a wire mesh covering or louvered panels for optimum coil protection. In applications where unauthorized personnel may have access to the units, or the units may be susceptible to severe weather conditions such as hail, the louvered panel provides protection around the entire condensing section giving the maximum protection to the coils and refrigerant components.

Hot gas reheat

The rooftop units have the option to order a hot gas reheat (HGRH) system. The HGRH is used to help with dehumidification of the space.

Heating section

Gas heat design and control options

Include an unsurpassed 24:1 turndown modulating gas furnace, and staged heating control. A Staged furnace is also available that allows up to six stages of capacity.

Staged gas heat

The rooftop gas furnace is an induced-draft gas furnace designed for high efficiency and reliability. The furnace uses an aluminized steel tubular heat exchanger and operates at temperatures sufficient to prevent acidic exhaust gases from condensing in the heat exchanger at low fire rates, unlike drum and tube style furnaces that generate condensation formation.

Electric

The rooftop unit is also available with an electrical heater that can range from 40 kW up to 250 kW. Depending on the size of the heat required, the Packaged Rooftop Unit can have three to six steps of control helping to provide tighter control of the supply and zone conditioned air. With the utilization of this multi-step function, the rooftop unit can effectively reduce energy consumption by bringing on smaller stages of heat while maintaining the maximum level of comfort.

Air management

The FlexSys™ underfloor air system provides a cutting edge, cost competitive alternative to conventional overhead air distribution systems based on the performance and system flexibility benefits that it can provide. When combined with a Packaged Rooftop Unit, the system offers a completed package that provides an optimum solution for building comfort control.

FlexSys technology uses the open space between the structural concrete slab and the underside of a raised access floor system to deliver conditioned air directly into the occupied zones of office and other commercial buildings. This underfloor plenum incorporates the air distribution system with the building power, telecom, and data cabling in one easily accessed service plenum.

The raised access floor concept is a proven design ideal for office buildings that house today's modern business that relies on critical information technologies to maintain high productivity levels. The unmatched flexibility offered by raised floor systems allows for significant costs savings and reduced downtimes when a fast-paced economy demands office space reconfiguration.

DWDI airfoil fans

High efficiency fans are used to improve application flexibility, and address sound and application concerns.

Building pressure control

Return fans, exhaust fans, and barometric relief dampers are available to meet building pressure control requirements. Select the most appropriate option for a given application.

Variable frequency drives

When a variable air volume (VAV) unit is ordered, it comes standard with variable frequency drives (VFDs). The VFD can optimize a systems performance by modulating the supply fan motor speed to reduce energy consumption by as much as 40% while maximizing occupant comfort.

Fan spring isolation

2 in. spring isolation is used to prevent vibration transmission from the rooftop unit's supply fan to the building.

Controls

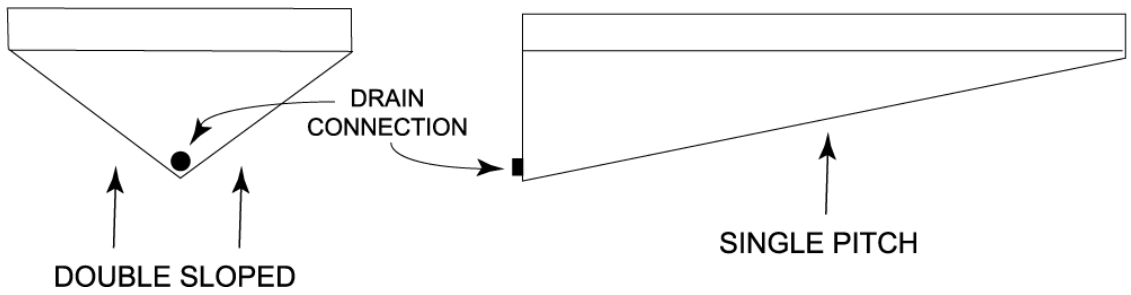
Rooftop controller

The ColdFire™ processor-based controller uses the latest in processor technology to provide the highest level of rooftop control with BACnet® open protocol communication capabilities. An 80-character display and keypad are standard for simple, and easy to understand manipulation of control setpoints and readout of operating parameters and diagnostics. Shutdown and alarm faults are all recorded in memory, and include a time and day stamp for easy troubleshooting.

BACnet

The rooftop can be adapted to operate with any building automation system that is BACnet compatible making it the most flexible large commercial rooftop units on the market.

Figure 3: Double sloped stainless steel drain pan



Note: This is a visual reference only. Actual drain pan pitch varies.

Indoor air quality

Double sloped stainless steel drain pan

The standard stainless steel drain pan meets ASHRAE 62 requirements for condensate drainage to improve indoor air quality. Solid wall liners encase insulation and prevent moisture from damage. Additional benefits include easy cleanability and isolates insulation from conditioned airstream.

Double wall construction

Double wall construction is the standard construction of the unit and incorporates powder coated pre-fabricated outer panels and corner post for maximum exterior surface protection.

Factory shrinkwrap

All Packaged Rooftop Units can be ordered from the factory with an optional factory-fresh shrinkwrap packaging. This eliminates the contractor's worries about dirt and debris clogging up condenser coils or moisture leaking into the air handler on the units way to the job site or rigging yard.

Demand ventilation

Demand ventilation can be incorporated into the unit to improve indoor air quality and help manage indoor pollutants such as CO_2 or other harmful airborne contaminates out of the occupied spaces for maximum comfort and safety. Activation of this sequence can easily be accomplished using CO_2 sensors connected to the unit. The rooftop IPU board includes two analog inputs for sensors to sense indoor and/or outdoor CO_2 levels to maintain optimum occupant comfort and safety. CO_2 sensors are typically used with demand ventilation; however other sensors may be applied to control indoor contaminants such as volatile organic compounds (VOCs).

Smoke purge

Smoke purge is also available through the User Interface to evacuate smoke due to fire from a room or zone.

Filtration

The rooftop unit is configured for various types of filtration to meet the different needs and requirements of today's rooftop applications, including 2 in. throwaway, pleated, carbon, and cleanable filters and 12 in. high efficiency rigid filters.

Electrical

Single point power

The unit comes standard with single point power connections to make installation quick and easy.

Dual point power

Dual point power can be factory installed for applications that require the mechanical heating and cooling functions to be separated from the air handling functions. This enables the unit to be operated in an emergency condition while minimizing power consumption.

Unit-mounted disconnect

This option is available to minimize time at installation of equipment and to reduce necessary field installed items.

Service and installation

Access doors

Full-sized access doors provide easy access into the unit for routine maintenance and inspection.

Service valves

Oversized service valves to provide isolation and quick reclamation and charging of system refrigerant are available to minimize downtime and simplify the service and repair task.

Convenience outlet

For maintenance tasks requiring power tools, an optional 110 V GFCI power supply can power lights, drills or any other power hand tool needed.

Factory run-tested

Each unit is subjected to a series of quality assurance checks as well as an automated quality control process before being run-tested. Fans and drives are balanced at the factory during testing. The factory run-test ensures safe proper operation when the unit is installed, and reduces installation and commissioning time.

Replaceable core filter drier

This option provides a means to remove moisture, dirt and debris from the refrigeration circuit in the event it is opened.

Installation

Approvals

Designed certified by ETL and CETL as follows:

1. For use as a forced air furnace with cooling unit (gas heat models).
2. For outdoor installation only.
3. For installation on combustible material and may be installed directly on combustible flooring or Class A, Class B, or Class C roof covering materials.
4. For use with natural gas or LP (propane) gas.
5. When used with LP gas, one of the following conversion kits must be installed before the gas heat section is fired:

    a. 375,000 BTU input - P/N 385-01866-001
    b. 750,000 BTU input - P/N 385-01866-002
    c. 1,125,000 BTU input - P/N 385-01866-003

Not suitable for use with conventional venting systems.

Limitations

The installation of this unit must conform to local building codes, or in the absence of local codes, with ANSI 223.1 Natural Fuel Gas Code and /or CAN/CGA B149 installation codes.

In U.S.A.:

1. National Electrical Code ANSI/NFPA No. 70 - Latest Edition.
2. National Fuel Gas Code Z223.1 - Latest Edition.
3. Gas-Fired Central Furnace Standard ANSI Z21.47 - Latest Edition.
4. Local gas utility requirements.

Table 1: Voltage limitations

Nominal voltage	Unit power supply	Voltage variations	
		Min. volts	Max. volts
600	575-3-60	540	630
480	480-3-60	432	504
240	230-3-60	216	252
208	200-3-60	182	218

Refer to Table 1 for voltage limitations and Table 10 for airflow and entering air/ambient conditions limitations.

⚠ CAUTION

If the variable air volume (VAV) boxes in the conditioned space have hydronic heating coils installed, it is the responsibility of the installing contractor to take appropriate measures to protect the hydronic coils against low unit supply air temperatures that could result in the freeze up and rupture of the coils.

Unit inspection

Immediately upon receiving the unit, it should be inspected for possible damage, which may have occurred during transit. If damage is evident, it should be noted in the carrier's freight bill. A written request for inspection by the carrier's agent should be made at once. See *Shipping Damage Claims (50.15-NM)* for more information and details.

⚠ CAUTION

To ensure warranty coverage, this equipment must be commissioned and serviced by an authorized YORK service mechanic or a qualified service person experienced in packaged rooftop installation. Installation must comply with all applicable codes, particularly in regard to electrical wiring and other safety elements such as relief valves, HP cutout settings, design working pressures, and ventilation requirements consistent with the amount and type of refrigerant charge. Lethal voltages exist within the control panels. Before servicing, open and tag all disconnect switches.

Locations and clearances

The following guidelines should be used to select a suitable location for unit installation.

1. Unit is designed for outdoor installation only.
2. Condenser coils must have an unlimited supply of air. Where a choice of location is possible, position the unit on either north or east side of building.
3. Suitable for roof mount on curb.
4. Roof structures must be able to support the weight of the unit and its accessories. Unit must be installed on a solid level roof curb or appropriate angle iron frame.
5. Maintain level tolerance to 0.5 in. across width and 2 in. along the length.

Unit clearances are shown in Figure 4.

ⓘ **Note:** The clearances shown are to provide adequate condenser airflow and service access to inside the unit. Additional clearance should be considered for component replacement such as compressors, evaporator coils, and supply or exhaust fans. While it is a common practice to operate the fan as soon as possible (air movement during construction)on the job site, the incomplete ductwork and missing diffuser grilles will greatly reduce air resistance and will allow the fan to operate beyond design parameters. This practice may result in water carry over and flooding of the unit. Also, the supply fan motor may overamp and become damaged.

Rigging and handling

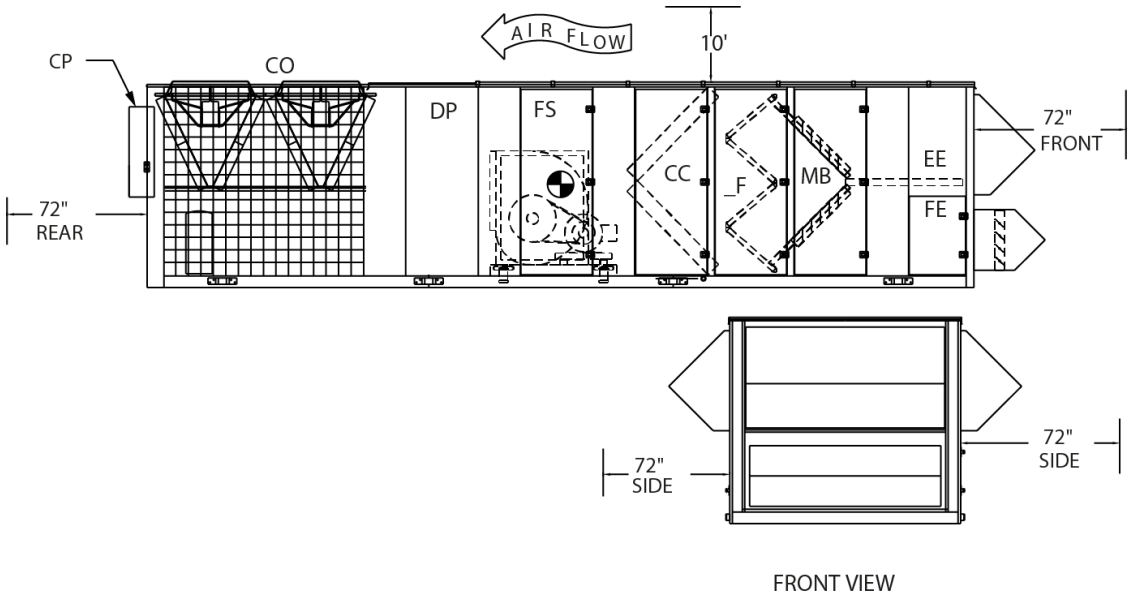
Proper rigging and handling of the equipment is mandatory during unloading and setting it into position to retain warranty status. All lifting lugs must be used to prevent twisting and damage to the unit.

Care must be taken to keep the unit in the upright position during rigging and to prevent damage to the water-tight seams in the unit casing. Avoid unnecessary jarring or rough handling.

See Figure 5 for number and location of the lifting lugs by unit size. It is also mandatory that an experienced and reliable rigger be selected to handle unloading and final placement of the equipment. The rigger must be advised that the unit contains internal components and that it be handled in an upright position. Care must be exercised to avoid twisting the equipment structure.

Unit weights are listed under Table 3 in this manual. These weights must be referred to when selecting a crane for rigging and figuring roof weight loads. Contact your YORK Sales Office if you have any questions regarding unit weights.

Figure 4: Unit clearances



Note:

1. 10 ft (3 m) clearance minimal over the top of the condensing unit.
2. Only one adjacent wall can exceed unit height.
3. 12 ft (3.6 m) clearance required to adjacent units.
4. 8 ft (2.4 m) service access recommended on one side.
5. Economizer and exhaust hoods, where applicable, are folded inside unit for shipment.
6. Dim. is to outside of lifting lugs.

Figure 5: Lifting lug locations

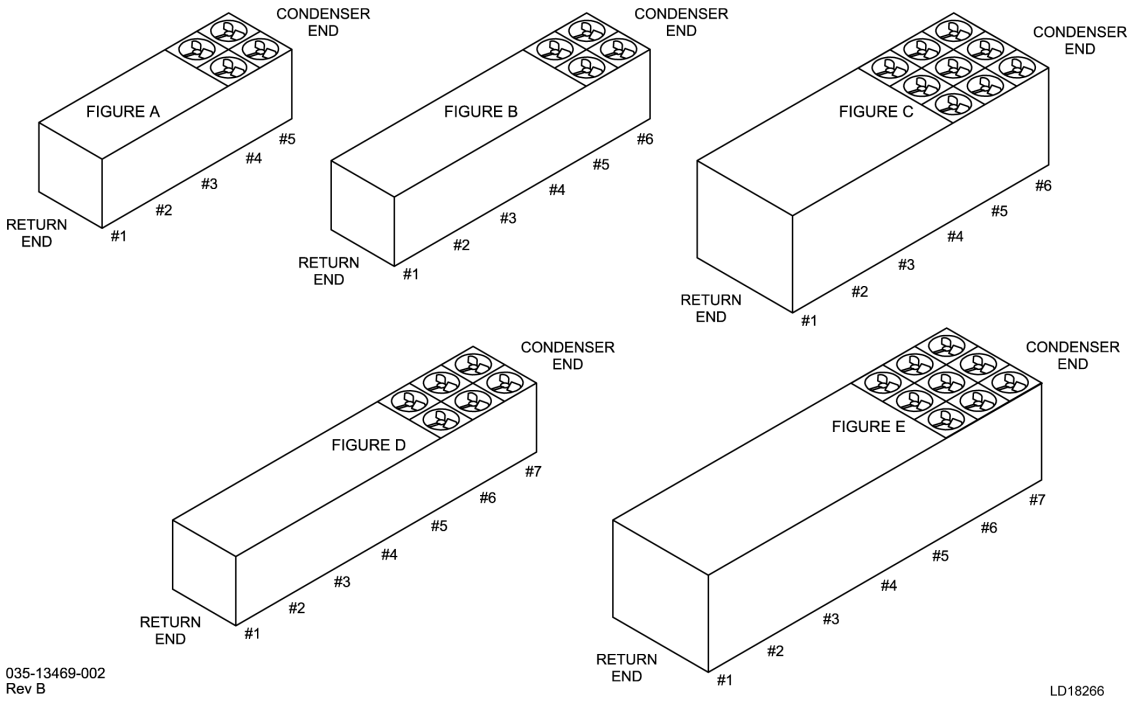


Table 2: Lifting lug locations

See Figure 5 for rigging	Model	Cabinet	Lift points dimensions taken from end opposite condenser													
Use figure			#1		#2		#3		#4		#5		#6		#7	
			In.	Metric	In.	Metric	In.	Metric	In.	Metric	In.	Metric	In.	Metric	In.	Metric
A	050	Standard	16.9	430	79.3	2015	147.9	3757	207.8	5278	315.0	8802	-	-	-	-
	051	Standard	16.9	430	79.3	2015	147.9	3757	207.8	5278	315.0	8802	-	-	-	-
	060	Standard	16.9	430	79.3	2015	147.9	3757	207.8	5278	315.0	8802	-	-	-	-
	061	Standard	16.9	430	79.3	2015	147.9	3757	207.8	5278	315.0	8802	-	-	-	-
B	050	Extended	16.9	430	79.3	2015	147.9	3757	207.8	5278	254.6	6467	361.9	9191	-	-
	051	Extended	16.9	430	79.3	2015	147.9	3757	207.8	5278	254.6	6467	361.9	9191	-	-
	060	Extended	16.9	430	79.3	2015	147.9	3757	207.8	5278	254.6	6467	361.9	9191	-	-
	061	Extended	16.9	430	79.3	2015	147.9	3757	207.8	5278	254.6	6467	361.9	9191	-	-
C	120	Standard	22.8	578	117.6	2981	181.9	4591	239.4	6172	296.3	7526	406.4	10323	-	-
	130	Standard	22.8	578	117.6	2981	181.9	4591	239.4	6172	296.3	7526	406.4	10323	-	-
	150	Standard	22.8	578	117.6	2981	181.9	4591	239.4	6172	296.3	7526	406.4	10323	-	-
D	070	Standard	29.9	759	77.0	1956	197.0	5004	270.5	6871	318.6	8093	373.8	9493	428.9	10894
	070	Extended	29.9	759	77.0	1956	197.0	5004	270.5	6871	381.6	9693	436.8	11093	491.9	12494
	075	Standard	29.9	759	77.0	1956	197.0	5004	270.5	6871	318.6	8093	373.8	9493	428.9	10894
	075	Extended	29.9	759	77.0	1956	197.0	5004	270.5	6871	381.6	9693	436.8	11093	491.9	12494
	080	Standard	29.9	759	77.0	1956	197.0	5004	270.5	6871	318.6	8093	373.8	9493	428.9	10894
	080	Extended	29.9	759	77.0	1956	197.0	4826	270.5	6871	381.6	9693	436.8	11093	491.9	12491
	090	Standard	29.9	759	99.0	2515	190.0	4826	302.5	7684	353.1	8970	408.3	10370	463.4	11770
	090	Extended	29.9	759	99.0	2515	190.0	4826	302.5	7684	422.1	10722	477.3	12122	532.4	13522
	105	Standard	29.9	759	99.0	2515	190.0	4826	302.5	7684	353.1	8970	408.3	10370	463.4	11770
	105	Extended	29.9	759	99.0	2515	190.0	4826	302.5	7684	422.1	10722	477.3	12122	532.4	13522

Table 2: Lifting lug locations

See Figure 5 for rigging	Model	Cabinet	Lift points dimensions taken from end opposite condenser													
Use figure			#1		#2		#3		#4		#5		#6		#7	
			In.	Metric	In.	Metric	In.	Metric	In.	Metric	In.	Metric	In.	Metric	In.	Metric
E	120	Extended	22.8	578	117.6	2981	181.9	4591	239.4	6172	307.0	7798	360.3	9151	470.4	11949
	130	Extended	22.8	578	117.6	2981	181.9	4591	239.4	6172	307.0	7798	360.3	9151	470.4	11949
	150	Extended	22.8	578	117.6	2981	181.9	4591	239.4	6172	307.0	7798	360.3	9151	470.4	11949

Table 3: Physical data 70 ton models

Model size	070
General data	
Standard cabinet length without hoods (in.)	454
Extended cabinet length without hoods (in.)	517
Width (in.)	92
Height (in.)	92
Weights (lb) (base unit, no option)	
Base cabinet, cooling only with economizer	11,817
Extended cabinet, cooling only with economizer	13,027
Option weights (lb)	
Power exhaust (blower, mtr, mtr base, fan skid, mod damper, and hood)	1045
Power exhaust (blower, mtr, mtr base, fan skid, VFD,baro damper, and hood)	1044
100% AMS (measurement station and mounting)	125
25/75% AMS (measurement station and mounting)	146
Min. AMS (measurement station and mounting)	45
Barometric only	45
375 MBH gas heat	162
750 MBH gas heat	324
1125 MBH gas heat	486
40 kW/480/3/60 2 steps electric heat	NA
80 kW/208/3/60 or 108 kW/240/3/60 6 steps electric heat	NA
108 kW/480/3/60 3 steps electric heat	470
150 kW/480/3/60 4 steps electric heat	490
200 kW/480/3/60 6 steps electric heat	510
250 kW/480/3/60 7 steps electric heat	530
Condenser wire guard	40
Copper condenser coils (additional)	617
Copper evaporator coils (additional)	280
Hot water coil	318
Steam heating coil	236
Diffuser**	53
Final filters**	535
Final filters, racks only**	297
Roof curb weights (lb)	
14 in. full perimeter roof curb	1,020
14 in. open condenser roof curb	577
Compressor data	
Quantity/size (nominal HP)	6x10
Type	Scroll
Capacity steps (qty x %)	6x16
Refrigerant charge (R410A STD cabinet)*	
SYS 1 - LB (kg)	44.3

Table 3: Physical data 70 ton models

Model size	070
SYS 2 - LB (kg)	38.5
SYS 3 - LB (kg)	42.4
Refrigerant charge (R410A EXTD cabinet)*	
SYS 1 - LB (kg)	47.0
SYS 2 - LB (kg)	41.2
SYS 3 - LB (kg)	45.4
Refrigerant charge (R410A STD cabinet) w/ HGRH*	
SYS 1 - LB (kg)	35.5
SYS 2 - LB (kg)	34.8
SYS 3 - LB (kg)	30.8
Refrigerant charge (R410A EXTD cabinet) w/ HGRH*	
SYS 1 - LB (kg)	38.2
SYS 2 - LB (kg)	37.5
SYS 3 - LB (kg)	33.5

Note:

* Always verify proper charge values using the charge information printed on the rating plate on the unit.

** Weights are for components only and need to be added to the extended cabinet weights. The diffuser is required in the extended cabinet for any unit with hot water or final filter option.

Supply fan and drive	
Quantity	1
Type	FC
Size	28-25
Motor size range (min. to max. HP)	10–50
Air flow range (min. to max. CFM)	14000–29000
Static pressure range (min. to max. ESP)	0-4 in.
Optional airfoil supply fan	
Quantity	1 / 1
Type	AF
Size	32
Motor size range (min. to max. HP)	15–50
Air flow range (min. to max. CFM)	14000–29000
Static pressure range (min. to max. ESP)	0-6 in.
Optional direct drive plenum (DDP) supply fan	
Quantity	1
Type	DDP
Size	402-9-100/120
Motor size range (min. to max. HP)	10–75
Air flow range (min. to max. CFM)	14000–29000
Static pressure range (min. to max. ESP)	1–8 in.
Exhaust fan	
Quantity	2
Type	FC
Size	18-18
Motor size range (min. to max. HP)	10–20
Air flow range (min. to max. CFM)	4000–32000
Static pressure range (min. to max. ESP)	0–2 in.
Optional exhaust fan	
Quantity fans/motors	2 / 1

Type	FC
Size	20-18
Motor size range (min. to max. HP, total for two fans))	5–30
Airflow range (min. to max. CFM)	4000–36000
Static pressure range (min. to max. IWG)	0–2 in.
Optional return fan	
Quantity fans/motors	2 / 2
Type	Plenum
Size	270
Motor size range (min. to max. HP, total for two fans))	10–30
Airflow range (min. to max. CFM)	4000–32000
Static pressure range (min. to max. IWG)	0-3 in.
Evaporator coil	
Size (square feet)	56.9
Number of rows / fins per in.	4/17
Tube diameter / enhanced surface	3/8 in./Enhanced
Condenser coil	
Size (square feet)	164
Number of rows / fins per in.	1/21
Tube diameter / surface	1 mm/microchannel
Condenser fans	
Quantity	6
Type	Prop.
Diameter (in.)	36
Power (HP each)	2
Filters - 2 in. throwaway (pre-filter position)	
Quantity	10 / 15
Size (length x width) (in.)	25x16 / 25x20
Total filter face area (square feet)	77.1
Filters - 2 in. cleanable (pre-filter position)	
Quantity	10 / 15
Size (length x width) (in.)	25x16 / 25x20
Total filter face area (square feet)	77.1
Filters - 2 in. pleated, 30% efficient (pre-filter position)	
Quantity	10 / 15
Size (length x width) (in.)	25x16 / 25x20
Total filter face area (square feet)	77.1
Filters -12 in. rigid 65%, 2 in. 30% prefilter (pre-filter position)	
Quantity	2 / 8 / 9
Size (length x width) (in.)	16x20 / 25x16 / 25x20
Total filter face area (square feet)	55.8
Filters -12 in. rigid 95%, 2 in. 30% prefilter (pre-filter position)	
Quantity	2 / 8 / 9
Size (length x width) (in.)	16x20 / 25x16 / 25x20
Total filter face area (square feet)	55.8
Filters - 2 in. carbon (pre-filter position)	
Quantity	10 / 15
Size (length x width) (in.)	16x20 / 25x16 / 25x20
Total filter face area (square feet)	77.1
Filters - 12 in. rigid 95% in post-filter position	
Quantity	2 / 7 / 9
Size (length x width) (in.)	16x20 / 25x16 / 25x20
Total filter face area (square feet)	55.1
Gas Furnace	

Staged furnace sizes (input/output/stages)		375 mbh / 300 mbh / 2 stages
		750 mbh / 600 mbh / 4 stages
		1125 mbh / 900 mbh / 6 stages
Inlet gas pressure range (min. to max. IWG)	Natural	4.5–10.5 in. w.c.
	Propane	11.0–13.0 in. w.c.
Airflow range (min. to max. CFM)		6,950–36,000
Modulating furnace sizes (input/output/turndown)		375 mbh / 300 mbh / 8:1 turndown
		750 mbh / 600 mbh / 16:1 turndown
		1125 mbh / 900 mbh / 24:1 turndown
Inlet gas pressure range (min. to max. IWG)	Natural	4.5–10.5 in. w.c.
	Propane	11.0–13.0 in. w.c.
Minimum heat exchanger entering SAT		40.0°F
Airflow range (min. to max. CFM)		8,250–36,000
Electric heaters		
Size range (min. to max. kW)		80–200
Heating steps*		2–6
Minimum OAT For Mech. Clg.		45
Low ambient option min. OAT		0

Table 4: Physical data 75-105 ton models

Model size	075	080	090	105
General data				
Standard cabinet length without hoods (in.)	454	454	488	488
Extended cabinet length without hoods (in.)	517	517	557	557
Width (in.)	92	92	92	92
Height (in.)	92	92	92	92
Weights (lb) (base unit, no option)				
Base cabinet, cooling only with economizer	11,880	12,066	12,171	12,391
Extended cabinet, cooling only with economizer	13,090	13,276	13,467	14,687
Option weights (lb)				
Power exhaust (blower, mtr, mtr base, fan skid, mod damper, and hood)	1045	1045	1074	1074
Power exhaust (blower, mtr, mtr base, fan skid, VFD,baro damper, and hood)	1044	1044	1068	1068
100% AMS (measurement station and mounting)	125	125	140	140
25/75% AMS (measurement station and mounting)	146	146	162	162
Min. AMS (measurement station and mounting)	45	45	50	50
Barometric only	45	45	55	55
375 MBH gas heat	162	162	162	162
750 MBH gas heat	324	324	324	324
1050 MBH gas heat	486	486	486	486
40 kW/415/3/60 or 40 kW/480/3/60 2 steps electric heat	NA	NA	NA	NA
80 kW/208/3/60 or 108 kW/240/3/60 5 steps electric heat	510	510	NA	NA

Table 4: Physical data 75-105 ton models

Model size	075	080	090	105
108 kW/415/3/60 4 steps electric heat	470	470	510	510
150 kW/415/3/60 5 steps electric heat	490	490	530	530
200 kW/415/3/60 or 200 kW/480/3/60 6 steps electric heat	510	510	550	550
250 kW/480/3/60 7 steps electric heat	NA	NA	570	570
Condenser wire guard	40	40	45	45
Copper condenser coils (additional)	617	1,058	1,190	1,190
Copper evaporator coils (additional)	460	280	460	580
Hot water coil	318	318	318	318
Steam heating coil	236	236	236	236
Diffuser**	53	53	53	53
Final filters***	535	535	565	565
Final filters, racks only***	297	297	327	327
Roof curb weights (lb)				
14 in. full perimeter roof curb	1,020	1,020	1,040	1,040
14 in. open condenser roof curb	577	577	615	615
Compressor data				
Quantity/size (nominal HP)	4x11, 2x13	4x13, 2x11	2x13, 4x15	3x20, 3x15
Type	Scroll	Scroll	Scroll	Scroll
Capacity steps (qty x %)	6x16	4x16, 2x18	4x17, 2x15	3x14, 3x19
Refrigerant charge (R-410A STD cabinet)				
SYS 1 - LB (kg)	38.0	38.0	41.5	45.4
SYS 2 - LB (kg)	32.4	35.3	32.0	39.6
SYS 3 - LB (kg)	33.0	33.0	36.2	45.4
Refrigerant charge (R-410A EXTD cabinet)				
SYS 1 - LB (kg)	40.7	40.7	44.2	48.1
SYS 2 - LB (kg)	35.1	38.0	34.7	42.3
SYS 3 - LB (kg)	35.7	35.7	38.9	48.1
Supply fan and drive				
Quantity	1	1	1	1
Type	FC	FC	AF	AF
Size	28-25	28-25	32	32
Motor size range (min. to max. HP)	10–50	10–50	10–50	10–50
Air flow range (min. to max. cfm)	15550–29000	15000–32000	17500–36000	21000–36000
Static pressure range (min. to max. ESP)	0–4 in.	0–4 in.	0–4 in.	0–4 in.
Optional airfoil supply fan				
Quantity	1 / 1	1 / 1	1 / 1	1 / 1
Type	AF	AF	AF	AF
Size	32	32	32	32
Motor size range (min. to max. HP)	15–50	15–50	15–50	15–50
Air flow range (min. to max. cfm)	15550–29000	15000–32000	17500–36000	21000–36000

Table 4: Physical data 75-105 ton models

Model size	075	080	090	105
Static pressure range (min. to max. ESP)	0–6 in.	0–6 in.	0–6 in.	0–6 in.
Optional direct drive plenum (DDP) supply fan				
Quantity	1	1	1	1
Type	DDP	DDP	DDP	DDP
Size	402-9-100/120	402-9-100/120	402-9-100/120	402-9-100/120
Motor size range (min. to max. HP)	10–75	10–75	10–75	10–75
Air flow range (min. to max. cfm)	15550–29000	15000–32000	17500–36000	21000–36000
Static pressure Range (min. to max. ESP)	1–8 in.	1–8 in.	1–8 in.	1–8 in.
Exhaust fan				
Quantity	2	2	2	2
Type	FC	FC	FC	FC
Size	18-18	18-18	18-18	18-18
Motor size range (min. to max. HP)	10–20	10–20	10–20	10–20
Air flow range (min. to max. cfm)	40000-32000	40000-32000	40000-32000	40000-32000
Static pressure range (min. to max. ESP)	0–2 in.	0–2 in.	0–2 in.	0–2 in.
Optional exhaust fan				
Quantity fans/motors	2 / 1	2 / 1	2 / 1	2 / 1
Type	FC	FC	FC	FC
Size	20-18	20-18	20-18	20-18
Motor size range (min. to max. HP)	5–30	5–30	5–30	5–30
Airflow range (min. to max. CFM)	4000–36000	4000–36000	4000–36000	4000–36000
Static pressure range (min. to max. IWG)	0–2 in.	0–2 in.	0–2 in.	0–2 in.
Optional return fan				
Quantity fans/motors	2 / 2	2 / 2	2 / 2	2 / 2
Type	Plenum	Plenum	Plenum	Plenum
Size	270	270	270	270
Motor size range (min. to max. HP)	10–30	10–30	10–40	10–40
Airflow range (min. to max. CFM)	40000-32000	40000-32000	4000–36000	4000–36000
Static pressure range (min. to max. IWG)	0–3 in.	0–3 in.	0–3 in.	0–3 in.
Evaporator coil R-410A				
Size (square feet)	56.9	56.9	56.9	56.9
Number of rows/fins per inch	3/17	3/17	3/17	5/17
Tube diameter (in.)	3/8	3/8	3/8	3/8
Condenser coil (R410A)				
Size (square feet)	164	164	164	164
Number of rows/fins per in.	1/21	1/21	1/21	1/21
Tube diameter/surface	1 mm microchannel	1 mm microchannel	1 mm microchannel	1 mm microchannel
Condenser fans				
Quantity	6	6	6	6
Type	Prop.	Prop.	Prop.	Prop.

Table 4: Physical data 75-105 ton models

Model size		075	080	090	105
Diameter (in.)		36	36	36	36
Power (hp each)		2	2	2	2
Power (hp each)		2	2	2	2
Filters - 2 in. throwaway (pre-filter position)					
Quantity		10 / 15	10 / 15	12 / 18	12 / 18
Size (length x width) (in.)		25x16 / 25x20	25x16 / 25x20	25x16 / 25x20	25x16 / 25x20
Total filter face area (square feet)		77.1	77.1	92.5	92.5
Filters - 2 in. cleanable (pre-filter position)					
Quantity		10 / 15	10 / 15	12 / 18	12 / 18
Size (length x width) (in.)		25x16 / 25x20	25x16 / 25x20	25x16 / 25x20	25x16 / 25x20
Total filter face area (square feet)		77.1	77.1	92.5	92.5
Filters - 2 in. pleated, 30% efficient (pre-filter position)					
Quantity		10 / 15	10 / 15	12 / 18	12 / 18
Size (length x width) (in.)		25x16 / 25x20	25x16 / 25x20	25x16 / 25x20	25x16 / 25x20
Total filter face area (square feet)		77.1	77.1	92.5	92.5
Filters -12 in. rigid 65%, 2 in. 30% prefilter (pre-filter position)					
Quantity		2 / 8 / 9	2 / 8 / 9	8 / 12	8 / 12
Size (length x width) (in.)		16x20/25x16/25x20	16x20/25x16/25x20	25x16/25x20	25x16/25x20
Total filter face area (square feet)		55.8	55.8	61.6	61.6
Filters -12 in. rigid 95%, 2 in. 30% prefilter (pre-filter position)					
Quantity		2 / 8 / 9	2 / 8 / 9	8 / 12	8 / 12
Size (length x width) (in.)		16x20/25x16/25x20	16x20/25x16/25x20	25x16/25x20	25x16/25x20
Total filter face area (square feet)		55.8	55.8	61.6	61.6
Filters - 2 in. carbon (pre-filter position)					
Quantity		10 / 15	10 / 15	12 / 18	12 / 18
Size (length x width) (in.)		25x16 / 25x20	25x16 / 25x20	25x16 / 25x20	25x16 / 25x20
Total filter face area (square feet)		77.1	77.1	92.5	92.5
Filters - 12 in. rigid 95% in post-filter position					
Quantity		10 / 15	10 / 15	12 / 18	12 / 18
Size (length x width) (in.)		25x16 / 25x20	25x16 / 25x20	25x16 / 25x20	25x16 / 25x20
Total filter face area (square feet)		77.1	77.1	92.5	92.5
Gas furnace					
Staged furnace sizes (input/output/stages)		375 mbh / 300 mbh / 2 stages			
		750 mbh / 600 mbh / 4 stages			
		1125 mbh / 900 mbh / 6 stages			
Inlet gas pressure range (min. to max. iwg)	Natural	4.5–10.5 iwg			
	Propane	11.0–13.0 iwg			
Minimum air ON temperature		6,950–36,000	11,150–36,000	15,150–36,000	15,150–36,000
Airflow range (min. to max. cfm)		375 mbh / 300 mbh / 8:1 turndown			
Modulating furnace sizes (input/output/turndown)		750 mbh / 600 mbh / 16:1 turndown			
		1125 mbh / 900 mbh / 24:1 turndown			
		4.5–10.5 iwg			

Table 4: Physical data 75-105 ton models

Model size		075	080	090	105
Inlet gas pressure range (min. to max. iwg)	Natural	11.0–13.0 iwg			
	Propane	8,250–36,000	11,150–36,000	15,150–36,000	15,150–36,000
Minimum heat exchanger entering supply air temperature		40 °F			
Electric heaters					
Size range (min. to max. kW)		80–200	108–250	108–250	108–250
Heating steps***		2–6	2–6	2–6	2-6
Minimum outside air temp. for mech. cig.		45	45	45	45
Low ambient option min. outside air temp		0	0	0	0

Note:

* Always verify proper charge values using the charge information printed on the rating plate on the unit.

** Weights are for components only and need to be added to the extended cabinet weights. The diffuser is required in the extended cabinet for any unit with hot water or final filter option.

*** Electric heat steps and airflow range depends on voltage and size. Consult the air pressure drop tables for specific number of steps for a given voltage.

Electrical data

Electrical service sizing

In order to use the electrical service required for the cooling-only Packaged Rooftop Unit, use the appropriate calculations listed below from U.L. 1995. Based on the configuration of the rooftop, the calculations will yield different MCA (minimum circuit ampacity), and MOP (maximum overcurrent protection).

Using the following load definitions and calculations, determine the correct electrical sizing for your unit. All concurrent load conditions must be considered in the calculations, and you must use the highest value for any combination of loads.

Load definitions

- **LOAD1** is the current of the largest motor – compressor or fan motor.
- **LOAD2** is the sum of the remaining motor currents that may run concurrently with LOAD
- **LOAD3** is the current of the electric heaters – zero for cooling only units.
- **LOAD4** is the sum of any remaining currents greater than or equal to 1.0 amp.

Use the following calculations to determine MCA and MOP for units supplied with a single-point power connection:

$$MCA = (1.25 \times LOAD1) + LOAD2 + LOAD3 + LOAD4$$

$$MOP = (2.25 \times LOAD1) + LOAD2 + LOAD3 + LOAD4$$

If the MOP does not equal a standard current rating of an overcurrent protective device, then the marked maximum rating is to be the next lower standard rating. However, if the device selected for MOP is less than the MCA, then select the lowest standard maximum fuse size greater than or equal to the MCA.

Table 5: Supply, exhaust, return fan motor data

Premium efficiency - ODP				
Motor HP	Nominal voltage			
	208/3/60 FLA	230/3/60 FLA	460/3/60 FLA	575/3/60 FLA
5	14.0	13.2	6.6	5.3
7.5	20.4	19.4	9.7	8.0
10	26.0	25.0	12.5	10.0
15	38.0	36.0	18.0	14.2
20	52.0	48.0	24.0	18.9
25	64.0	60.0	30.0	24.5
30	76.0	72.0	36.0	28.0
40	99.0	98.0	49.0	40.0
50	121.0	114.0	57.0	46.0
60	144.0	136.0	68.0	56.0

Premium efficiency - TEFC				
Motor HP	Nominal voltage			
	208/3/60 FLA	230/3/60 FLA	460/3/60 FLA	575/3/60 FLA
5	13.9	13.4	6.7	5.3
7.5	20.0	19.0	9.5	7.6
10	25.4	24.0	12.0	9.6
15	38.0	36.2	18.1	14.6
20	52.0	48.0	24.0	19.2
25	64.0	62.0	31.0	24.0
30	78.0	76.0	38.0	24.0
40	102.0	96.0	48.0	37.0
50	128.0	116.0	58.0	45.0
60	149.0	135.0	67.8	54.4

Table 6: Condenser fan motor data

FLA each motor		208 V/3 Ph/60 Hz	230 V/3 Ph/60 Hz	460 V/3 Ph/60 Hz	575 V/3 Ph/60 Hz
		7.6	6.6	3.4	2.7
Model	Quantity of fans	208 V/3 Ph/60 Hz	230 V/3 Ph/60 Hz	460 V/3 Ph/60 Hz	575 V/3 Ph/60 Hz
YPAL070–105	6	45.6	39.6	20.4	16.2

Table 7: Miscellaneous electrical data

Description	Nominal voltage				
	208 V	230 V	460 V	575 V	380 V
	A	A	A	A	A
Control transformer 750 VA	3.6	3.3	1.6	1.3	2.0
Control transformer 1.0 KVA	4.8	4.4	2.2	1.8	2.6
Convenience outlet	9.6	8.7	4.4	3.5	NA
Gas heat	9.6	8.7	4.4	3.5	5.3

Table 8: Compressor data (R-410A)

Model	Compressor		Nominal voltage					
	Quantity	Model	208/230 V		460 V		575 V	
			RLA	LRA	RLA	LRA	RLA	LRA
070	6	ZP120	33.3	239	17.9	125	12.8	80
075	2	ZP154	51.3	300	23.1	150	19.9	109
	4	ZP137	48.1	245	18.6	125	14.7	100
080	4	ZP154	51.3	300	23.1	150	19.9	109
	2	ZP137	48.1	245	18.6	125	14.7	100
090	4	ZP182	55.8	340	26.9	173	23.7	132
	2	ZP154	51.3	300	23.1	150	19.9	109
105	3	ZP182	-	-	26.9	173	23.7	132
	3	ZP235	-	-	30.8	229	25.0	180

ⓘ **Note:** RLA data is per compressor.

Table 9: Electric heat AMP draw

kW*	Nominal voltage			
	208 V/3 Ph/60Hz	230 V/3 Ph/60 Hz	460 V/3 Ph/60 Hz	575 V/3 Ph/60 Hz
	A	A	A	A
80	193	193	96	80
108	260	260	130	109
150	—	—	181	151
200	—	—	241	201
250	—	—	301	251

ⓘ **Note:** * Heaters are sized as follows:

- 208 V heaters are rated at 208 V.
- 230 V heaters are rated at 240 V.
- 460 V heaters are rated at 480 V.
- 575 V heaters are rated at 600 V.

Table 10: Airflow and entering air/ambient limitations

Limitations	Model size				
	70	75	80	90	105
Minimum airflow at standard design conditions. CFM* (min to max)	14,000–32,000	14,000–32,000	14,000–32,000	18,000–36,000	20,000–36,000
Entering wet bulb temp (°F) (min/max)	57/75	57/75	57/75	57/75	57/75
Entering dry bulb temp (°F) (min/max)	68/90	68/90	68/90	68/90	68/90
Ambient temp (°F) without low amb option	50/120	50/120	50/120	50/120	50/120
Ambient temp (°F) with low amb option	0/120	0/120	0/120	0/120	0/120

ⓘ **Note:** * Cooling only units.

Filters

2 in. throwaway filters are standard and factory installed in a filter rack located prior to the evaporator coil. Any optional pre-filters ordered with the unit is shipped inside the unit, but must be filed installed. The unit can also be ordered with an extended cabinet and 95% efficient post-filters. These post-filters are installed at the factory.

Pre-filters must always be installed ahead of the evaporator coil. Post and pre-filters must be kept clean and replaced with the same size and type as shipped with the unit. Dirty filters will reduce the

capacity of the unit and may result in frosted coils and safety shutdowns. Required filter sizes and qualities are shown in Table 3. The unit should never be operated for any length of time without the proper filters installed in the unit.

Condensate drain

Condensate drain piping

The two cooling coils are located in the units so that the supply air is drawn through them. This results in the condensate being subjected to negative (-) static pressure. Unless some means of pressure equalization is provided in the condensate drain, the air rushing back through the drainpipe will cause the condensate to build up in the drain pan. As the unit continues to operate, the accumulated water is carried with the air stream, overfilling the drain pan causing possible water leaks into the supply duct and/or causing water damage in the building. A trap must be installed to prevent this condensate water build-up (see Figure 6 and Figure 7).

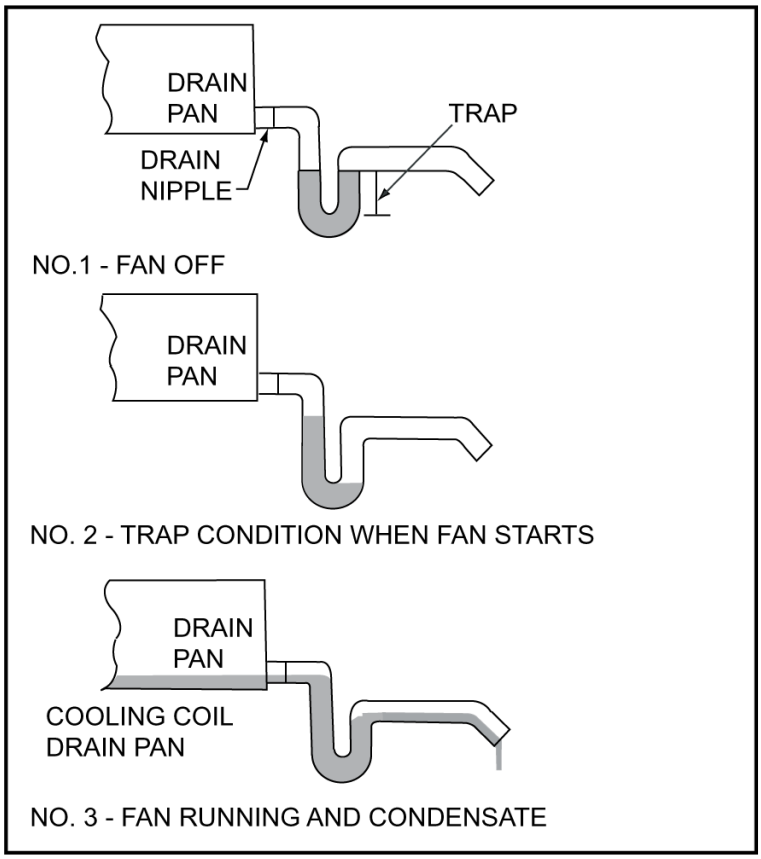
Condensate drain trap

For draw-through applications install a trapped condensate drain line at unit drain connection (see Figure 7) according to all governing codes. H dimension must be at least 1 in. greater than design total static pressure (TSP) of fan.

The trap and drain lines should be protected from freezing. Plumbing must conform to local codes. Use a sealing compound on male pipe threads. Install condensate drain lines from the 1 1/4 in. NPT female connections on the unit to an open drain.

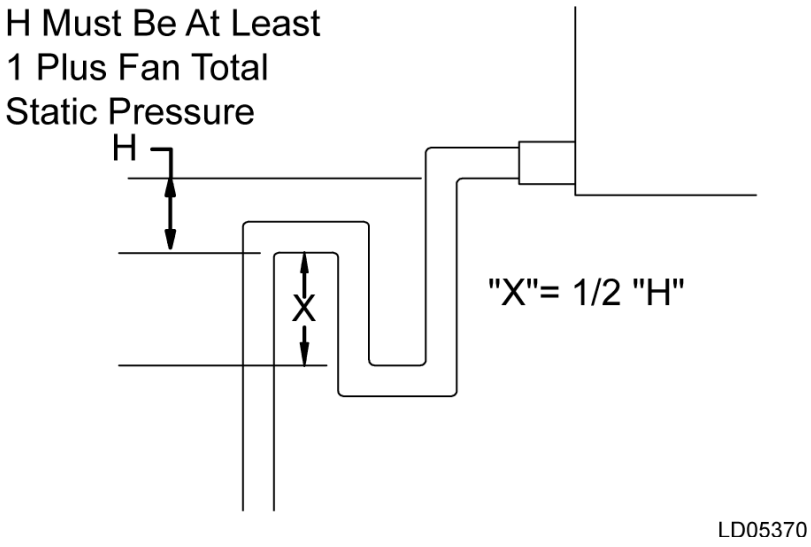
ⓘ **Note:** The unit must be properly trapped and charged with water before the units are started.

Figure 6: Drain trap showing water location during draw through operation stages



LD06342-1

Figure 7: Trap detail for draw through application



Air hoods for economizer

There are three economizer outside air intake hoods provided with the unit. The hood on the end of the unit is factory mounted. The two front and rear hoods are made operational per the following instructions:

1. Remove the screws holding the economizer hood shipping covers in place. Discard covers.
2. Apply a bead of RTV sealer along the edge of both hoods and each pivot joint to prevent water leakage.
3. Rotate the hoods out (each hood is hinged). Secure the hoods with screws along the top and sides.
4. Seal any unused screw holes with RTV or by replacing the screw.

Air hoods for fixed outside air (units without economizer)

These hoods are factory installed. The dampers may be adjusted by loosening the thumb screw, turning the lever to the desired position, and retightening the thumb screw.

Air hoods for exhaust air

When furnished, these hoods and dampers are factory installed.

Field wiring

Figure 8 and Figure 9 show the field control wiring to CTB1. All field control wiring is field supplied and installed.

Thermostat

A thermostat (2 stage cool or 2 stage heat) can be used on CV units. On CV units the thermostat is the primary means of control for the unit. The thermostat should be mounted on an inside wall approximately 56 in. (142 cm) above the floor where it will not be subject to drafts, sun exposure or heat from electrical fixtures or appliances.

Space sensor

The space sensor (if used) can be used on either CV or VAV units. The space saver sensor can be used for unit control in lieu of a thermostat on CV units. For single zone VAV (SZVAV) units, only a space sensor can be used. This can be hardwired or a communicated signal. Even if a thermostat is wired to the rooftop unit, the space sensor will supply space air temperature values if connected. When mounting a space sensor, it should be located on an inside wall approximately 56 in. above the floor where it will not be subject to drafts, sun exposure or heat from electrical fixtures or appliances.

ⓘ **Note:** The shielded wire used must only be grounded at the control panel.

CO_2 sensor

The optional CO_2 sensor is used for demand ventilation. When ordered a CO_2 sensor is installed in the outdoor and return air stream.

Occupied/unoccupied input

A contact-closure input is provided for hard-wiring an external device such as a central time clock, a thermostat with scheduling or BAS system, or a manual switch.

Contact Closure = Occupied

Contacts Open = Unoccupied

Note that 24 volts (24 VAC), terminal 1 of the terminal block CTB1, must be used as the 24 VAC source for switching the contact to the IPU board Occupied/Unoccupied input. Use of any power source external to the controller will result in damage to the IPU board.

Shutdown input

A contact-closure input is provided for emergency shutdown of the unit. When this circuit is open, the unit shuts down with supply fan, exhaust fan turned OFF, and outside air dampers are closed. This state is maintained until the input is activated (contacts closed).

- Contact Closed = Normal Operation
- Contacts Open = Shutdown

Note that a jumper is installed at the factory between terminals 3 (24 VAC) and terminal 4 (SD) of the low voltage terminal block CTBl. When a field shutdown input is used, the jumper must be removed and the external dry contact connected between terminal 3 and 4. The connection of an external power supply to these terminals will result in damage to the IPU board.

Smoke purge input

There are three field connection points for smoke purge operation: smoke purge l, smoke purge 2, and smoke purge 3.

When a field supplied dry contact is closed between terminal 3 (24 VAC) and terminal 6 (SMK1), the unit will initiate whatever smoke purge sequence has been programmed into the IPU board for smoke purge sequence 1.

When a field supplied dry contact is closed between terminal 3 (24 VAC) and terminal 7 (SMK2), the unit will initiate whatever smoke purge sequence has been programmed into the IPU board for smoke purge sequence 2.

When a field supplied dry contact is closed between terminal 3 (24 VAC) and terminal 8 (SMK3), the unit will initiate whatever smoke purge sequence has been programmed into the IPU board for smoke purge sequence 3.

Refer to Smoke purge for additional programming information. The smoke purge operating state is maintained until the contact is opened.

⚠ CAUTION

No external power source may be used when field wiring any of the above inputs. The 24 VAC source on terminal 3 of the terminal block CTB1 must be used as the power source when field wiring these inputs, as shown in Figure 8 and Figure 9. Failure to do so will result in improper unit operation and damage to the IPU board.

VAV heat relay output

This is a field wired OUTPUT that is used to command the VAV boxes to full open during morning warm up operation. This 24 VAC signal should have a maximum current draw not to exceed 20 VA. If the VA requirement of the VAV boxes approaches 20 VA, isolation relays should be field supplied and installed to avoid overloading the unit power supply.

Note that this signal is used to drive the VAV boxes open in morning warm up operations. Failure to drive the VAV boxes open during this mode of operation can cause unit shutdown and/or damage to the ductwork due to over pressurization.

⚠ CAUTION

The VAV heat relay output cannot exceed a current draw of 20 VA. If the power requirements of the VAV boxes exceed this amount, isolation relays must be field supplied and installed to prevent overloading the IPU board power supply.

Return air bypass damper

Units built with the FlexSys option has an opening in the base of the unit between the evaporator coil and the supply air blower. A FlexSys unit requires a means to bypass return air and mix it with the air off the evaporator coil. YORK does have a special curb with the return duct bypass built into the curb. The purpose of the damper is to temper the supply air to the under floor system by mixing return air with the air off the evaporator coil. After the system is initialized, the mixed air damper modulates based on the ratio of the difference between the mixed air temperature minus the supply air temperature compared to the return air temperature minus the supply air temperature. As the mixed air temperature decreases, the damper opens allowing more air to bypass the evaporator coil resulting in a higher mixed air temperature supply to the under floor system.

The mixed air damper must be wired and installed into the system in the field. The wires to connect the actuator are located in the supply fan section, in the proximity of the actuator in the supply fan section floor, opposite the supply fan motor side. The plug assembly or wires are attached with an elastic band and must be wired to the actuator, and the plugs mated together. Connect the wires to the motor as follows:

- Wire labeled 412 to terminal 1 in the actuator.
- Wire labeled 303 to terminal 2 in the actuator.
- Wire labeled 411 to terminal 5 in the actuator.

BACnet communication

The packaged rooftop unit can communicate to any building automation system using BACnet MS/TP communication protocol.

The field connections are made by connecting shielded two-wire cable to Port 1 on the IPU board.

Refer to Communication for additional information.

Dirty filter switch

On units with a dirty filter switch option, an adjustable differential pressure switch is installed to monitor the pressure drop across the filters. When the pressure drop across the filters exceeds the setting of the switch the switch closes sending a 24 V signal to the IPU board. The IPU board posts a trouble fault in the service memory buffer; but will not shut down the unit.

Alarm contacts

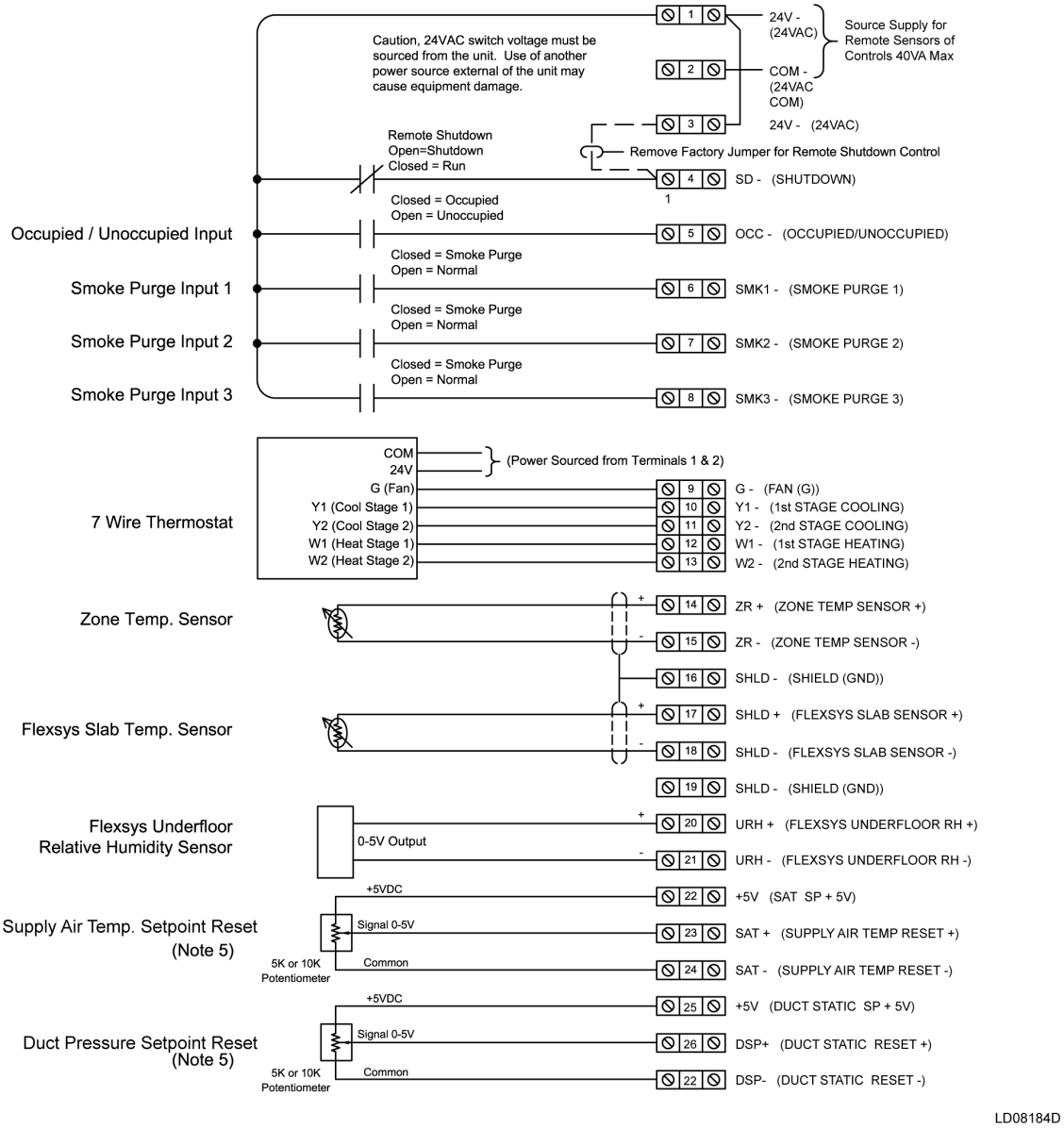
The IPU board has three sets dry alarm contacts that are closed during a fault. When the unit experiences a Supply Fan Fault, the IPU board closes a set of dry contacts between terminals 28 and 29 of the low voltage terminal block (CTB1).

When the unit experiences a Cooling/Heating Fault, the IPU board closes a set of dry contacts between terminals 30 and 31 of the low voltage terminal block (CTB1).

When the unit experiences a Sensor/Misc. Fault, the IPU board closes a set of dry contacts between terminals 32 and 33 of the low voltage terminal block (CTB1).

CTB1 field control wiring (inputs)

Figure 8: Field control wiring – inputs



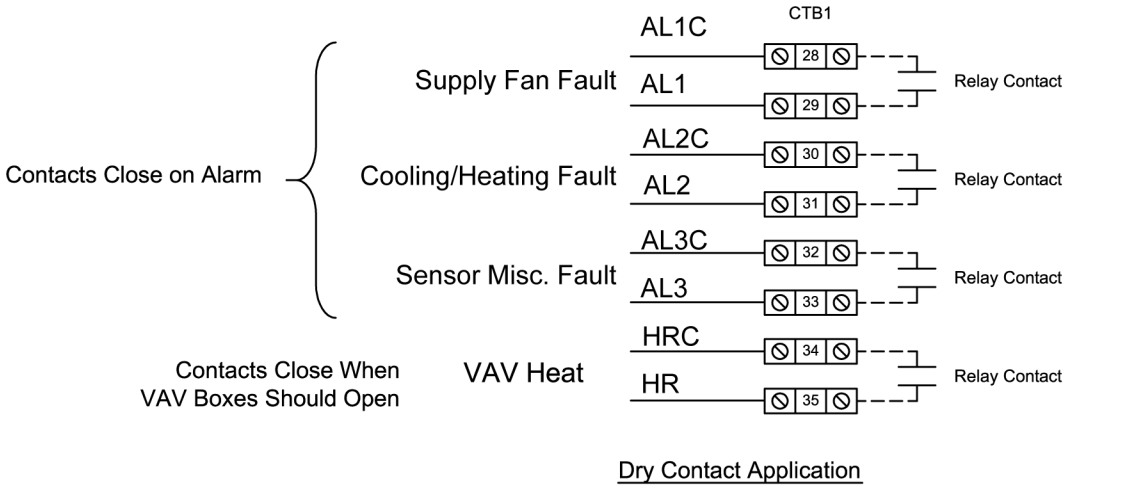
Wiring notes

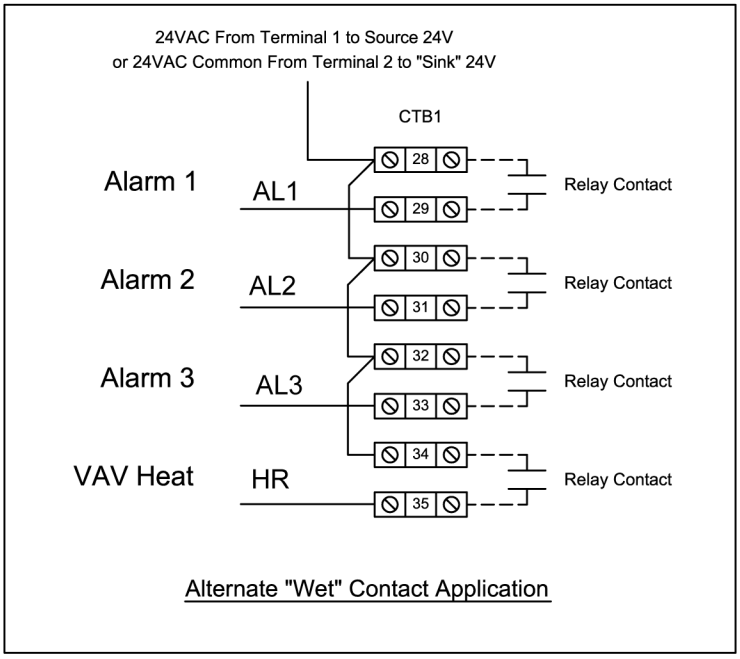
1. Wiring shown indicates typical wiring. Refer to IOM for more detailed wiring methods and options.
2. All wiring is Class 2, low voltage.
3. Maximum power available from the 24 VAC terminal is 40 VA.
4. Use shielded wire where shown.
5. Potentiometer application shown. As an alternative, signal inputs can be driven from an analog output of a third party controller. Note: Input resistance is 15 K ohms.

6. The FlexSys Underfloor Relative Humidity Sensor is field supplied. In addition to two wires that transmit the 0 to 5 VDC signal from the sensor to the IPU board, the Underfloor Relative Humidity Sensor also needs to be powered. The type of voltage required to power the sensor depends on the sensor selected. When the sensor uses 24 VAC, additional wires must be run to terminal 1 (24 VAC) and terminal 2 (24 VAC COM) of the CTB1 terminal block. When the sensor requires a different power source than 24 VAC, it must be field supplied.

CTB1 field control wiring (outputs)

Figure 9: Field control wiring - outputs





Id08186C

Wiring notes:

1. Wiring shown indicates typical wiring. Refer to the IOM for more detailed wiring methods and options.
2. All wiring is Class 2, low voltage.
3. Maximum power available from the 24 VAC terminal is 40 VA.
4. Use shielded wire where shown.
5. Relay contacts suitable for pilot duty to 1 A from 24 VAC to 120 VAC.

Power wiring

Field wiring to the unit must conform to provisions of National Electrical Code (NEC) ANSI / NFPA 70 latest edition and local ordinances. The unit must be electrically grounded in accordance with the NEC and local codes. Voltage tolerances, which must be maintained during starting and running conditions, are indicated on the unit data plate.

The internal wiring harnesses furnished with this unit are an integral part of the design certified unit. Field alteration to comply with electrical codes should not be required. If any of the wire supplied with the unit must be replaced, replacement wire must be of the type shown on the wiring diagram and the same minimum gauge as the replaced wire.

Power supply to the unit must be NEC Class 1 and must comply with all applicable codes. A disconnect switch must be provided (factory option available). The switch must be separate from all other circuits. Wire entry at knockout openings requires conduit fittings to comply with NEC and local codes.

Refer to Figure 10, Figure 11, and Figure 12 for typical field wiring and to the appropriate unit wiring diagram mounted inside control doors for control circuit and power wiring information.

⚠ CAUTION

Field power wiring connected to the incoming power termination point must be copper conductor only. Aluminum wire cannot be connected to the incoming power termination point.

Electrical service sizing

Electrical service is required for the cooling-only Packaged Rooftop Unit; use the appropriate calculations listed below from U.L. 1995. Based on the operating mode and configuration of the rooftop, the calculations will yield different MCA (minimum circuit ampacity), and MOP (maximum overcurrent protection). **MCA and Overcurrent Protection Device Data is supplied on the unit data plate.**

The following calculations apply to electrical data for the rooftop unit. All concurrent load conditions must be considered in the calculations, and you must use the highest value for any combination of loads.

Minimum Circuit Ampacity (MCA) is based on 125% of the rated load amps for the largest motor plus 100% of the rated load amps for all other loads included in the circuit, per N.E.C. Article 440-34.

The minimum recommended disconnect switch is based on 115% of the rated load amps for all loads included in the circuit, per N.E.C.

Maximum overcurrent protection is based upon 225% of the rated load amps for the largest motor plus 100% of the rated load amps for all other loads included in the circuit, per N.E.C. Article 440-22. If the maximum overcurrent protection does not equal a standard current rating of an

overcurrent protective device, then the marked maximum rating is to be the next lower standard rating. However, if the device selected for maximum overcurrent protection is less than the MCA, then select the lowest standard maximum fuse size greater than or equal to the MCA.

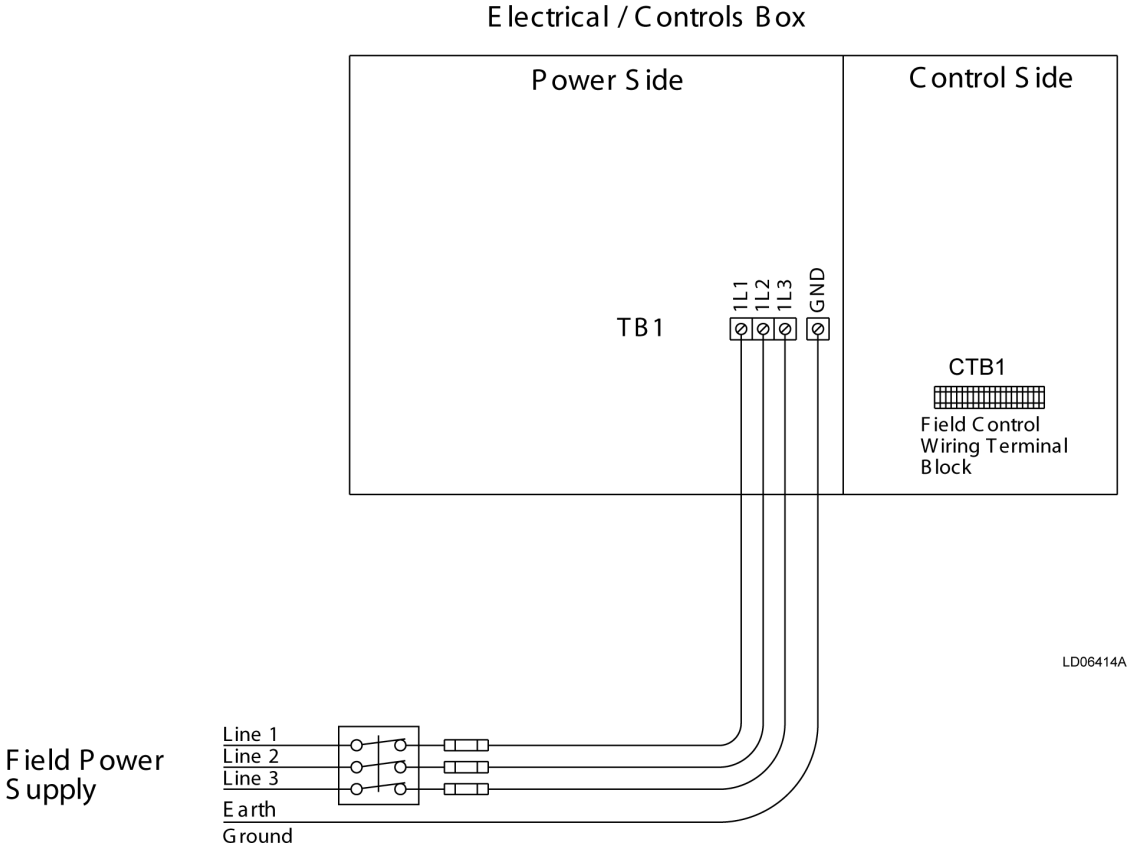
Figure 10, Figure 11, and Figure 12 show the power wiring that must be field supplied and installed.

For dual point power connections, TB1 in the power panel supplies the all unit compressors and condenser fans. TB2 in the power panel supplies power to the unit supply, return and exhaust fans, and control circuitry.

Note: All wiring must conform to the NEC and local codes that may be in addition to NEC.

Single-point power supply wiring

Figure 10: Single-point power supply wiring



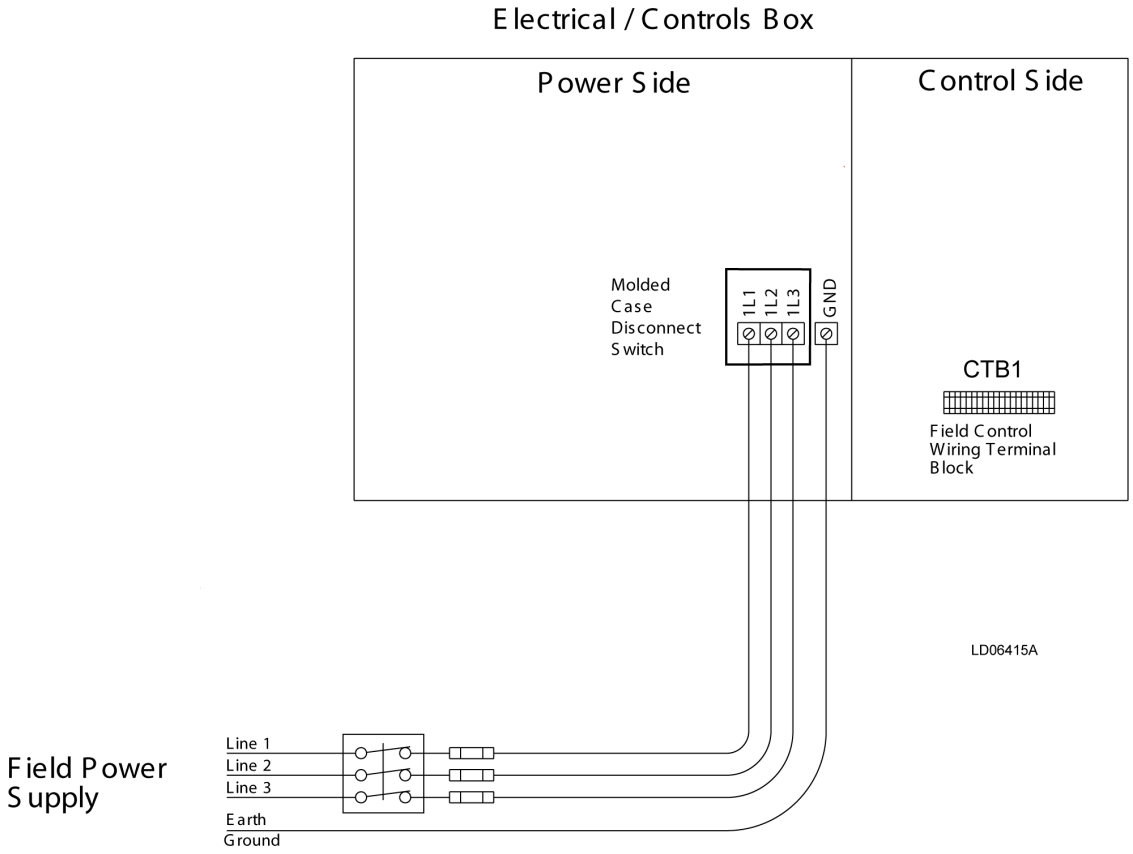
Note:

1. All field wiring must be provided through a field-supplied fused disconnect switch to the unit terminals (or optional molded disconnect switch).
2. All electrical wiring must be made in accordance with all N.E.C. and local code requirements.
3. MCA is based on U.L. Standard 1995, Section 36.14 (N.E.C. Section 440-34).
4. Maximum Dual Element Fuse size is based on U.L. Standard 1995, Section 36.15 (N.E.C. Section 440-22).
5. Use copper conductors only.

6. On units with an optional disconnect switch, the supplied disconnect switch is a disconnecting means as defined in the N.E.C. Section 100, and is intended for isolating the unit from the available power supply to perform maintenance and troubleshooting. This disconnect switch is not intended to be a load break device.

Single-point power supply wiring with non-fused disconnect switch

Figure 11: Single-point power supply wiring with non-fused disconnect



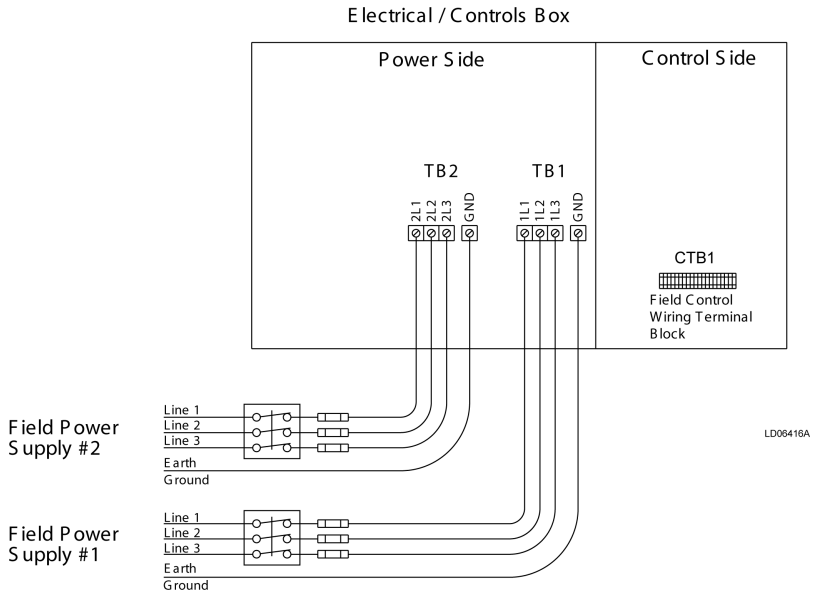
Note:

1. All field wiring must be provided through a field-supplied fused disconnect switch to the unit terminals (or optional molded disconnect switch).
2. All electrical wiring must be made in accordance with all N.E.C. and local code requirements.
3. MCA is based on U.L. Standard 1995, Section 36.14 (N.E.C. Section 440-34).
4. Maximum Dual Element Fuse size is based on U.L. Standard 1995, Section 36.15 (N.E.C. Section 440-22).
5. Use copper conductors only.

6. On units with an optional disconnect switch, the supplied disconnect switch is a disconnecting means as defined in the N.E.C. Section 100, and is intended for isolating the unit from the available power supply to perform maintenance and troubleshooting. This disconnect switch is not intended to be a load break device.

Dual-point power supply wiring

Figure 12: Dual-point power supply wiring



Note:

1. All field wiring must be provided through a field-supplied fused disconnect switch to the unit terminals (or optional molded disconnect switch).
2. All electrical wiring must be made in accordance with all N.E.C. and local code requirements.
3. MCA is based on U.L. Standard 1995, Section 36.14 (N.E.C. Section 440.34).
4. Maximum dual element fuse size is based on U.L. Standard 1995, Section 36.15 (N.E.C. Section 440.22).
5. Use copper conductors only.
6. On units with an optional disconnect switch, the supplied disconnect switch is a disconnecting means as defined in the N.E.C. Section 100, and is intended for isolating the unit from the available power supply to perform maintenance and troubleshooting. This disconnect switch is not intended to be a load break device.

Transducer pneumatic tubing

Static pressure control plastic tubing (pneumatic tubing)

Duct static transducers (all VAV units) and any unit with an optional building pressure control transducer, require pneumatic tubing to be field supplied and installed. The high side of the respective transducer must be routed to the location in the building or ductwork where a constant pressure is desired. Both the duct static transducer (VAV only) and optional building pressure

transducer are mounted behind the left hand damper door. All wiring from the transducers is factory installed.

Duct static transducer

Plastic tubing (1/4 in. ID) must be run from the high pressure tap of the transducer to a static pressure tap (field supplied) in the supply duct, located at a point where constant pressure is desired. This is normally two-thirds of the way down the duct, before the first take off.

Building pressure transducer

Plastic tubing (1/4 in. ID) must be run from the high pressure tap of the building static pressure transducer to a static pressure tap (field supplied) located in the conditioned space. The tap should be placed in a location where over pressurization will cause a problem (such as in the lobby area where excessive pressure will cause the doors to remain open). The tap should never be placed above the ceiling.

This allows for standard building pressure control through the IPU board. There is an option to control the VFD driven exhaust fan speed through the BAS, if desired. If the unit has a return fan, the same point can be used to control the modulating exhaust damper. The point for BAS control can be enabled in the Service key.

Static pressure probe installation

On units with duct static transducers (VAV units) and any unit with an optional building pressure, a factory supplied Static Pressure Probe must be field installed at the top of the rear corner post on the unit (see Figure 13).

The factory supplied atmospheric pressure probe and associated mounting hardware are shipped inside the control panel. The hardware consists of a mounting bracket and a short section of pneumatic tubing. The pneumatic tubing must be field installed from a factory pressure tap (next to the mounting location for the static pressure probe) to the atmospheric pressure probe (see *Static Pressure Probe Installation Instructions (Form 100.50-N1)*).

If the unit is equipped with both a building pressure transducer and a duct static transducer, a tee is factory installed, and both the duct static pressure transducer and building pressure is connected to the tee - both building static pressure transducer and duct static transducer will use the same factory supplied atmospheric pressure probe.

ⓘ **Note:** The low side connection of the duct static or building pressure transducers are shipped with the pneumatic tubing factory installed and routed, to the external factory pressure tap.

Roof curb installation

General information

When ordered, the roof curb is shipped knocked-down in a separate container and needs to be field assembled and installed. Refer to the *Installation Manual* that is shipped with the roof curb for specific instructions.

On full perimeter roof curb the opening in the roof should not extend under the condenser section of the curb. The condenser section of the roof curb is not insulated and could result in condensation build up under the condenser section as well as higher than normal sound levels in the conditioned space.

The roof curb drawings contained in the YORK literature are not intended as construction documents for the field fabrication of a roof curb. YORK will not be responsible for the unit fit up, leak integrity, or sound level with field fabricated roof curbs. Construction documents for field fabricated roof curbs are available upon request.

Note: Wood or fiber cant strips, roofing felts, roofing material, caulking and curb-to-roof fasteners are to be field supplied.

Duct system

Duct connection guidelines

All intake and discharge air duct connection to the unit may be made directly to the unit. These air duct connections should be on flexible material and should be installed so they are sufficiently loose. Duct runs and transitions must be made carefully to hold friction loss to a minimum. Avoid short turns, and duct elbows should contain splitters or turning vanes.

Duct work connected to the fan discharge should run in a straight line for at least two equivalent outlet diameters. Never deadhead the discharge into the flat surface of a plenum.

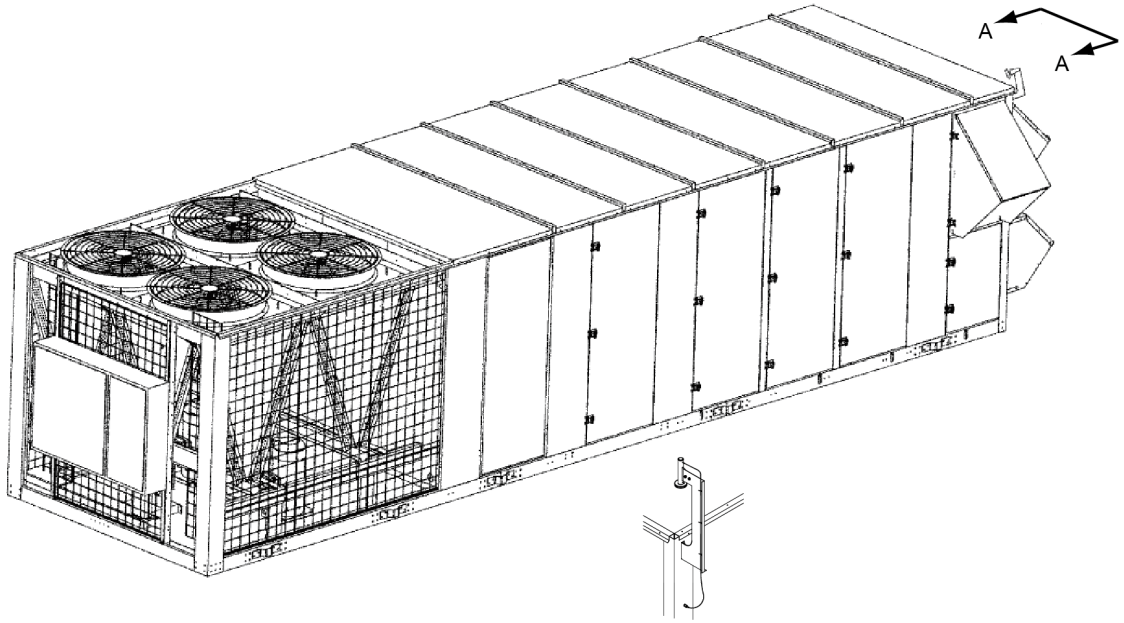
CAUTION

Installation of elbows, discharge damper and other abrupt flow area changes installed directly at the fan outlet will cause system losses. These losses must be taken into account during the design phase and must be added to any field measurements.

Sound and vibration transmission

All roof mounted air handling units generate some sound and vibration, which may or may not require some special treatment of the air conditioned space. The noise generated by the air handling unit is dependent on the speed of the fan, the amount of air the fan is moving, the fan type and the static efficiency of the fan. In applications where sound and vibration transmissions may be objectionable, good acoustical engineering practices must be incorporated in the system design.

Figure 13: Static pressure probe location



Gas heating

Gas piping

Proper sizing of the gas piping depends on the cubic feet per hour of gas flow required, specific gravity of the gas and the length of run. The latest edition of the National Fuel Gas Code Z223.1 should be followed in all cases unless superseded by local codes or gas company requirements. Refer to Table 11.

Table 11: Pipe sizes

Length in ft	Nominal iron pipe size	
	1 1/2 in.*	2 in.*
10	1,600	3,050
20	1,100	2,100
30	890	1,650
40	760	1,450
50	-	1,270
60	-	1,150
70	-	1,050
80	-	990

ⓘ **Note:** * Maximum capacity of pipe in cubic feet of gas per hour (based upon a pressure drop of 0.3 in. w.c. and 0.6 specific gravity gas).

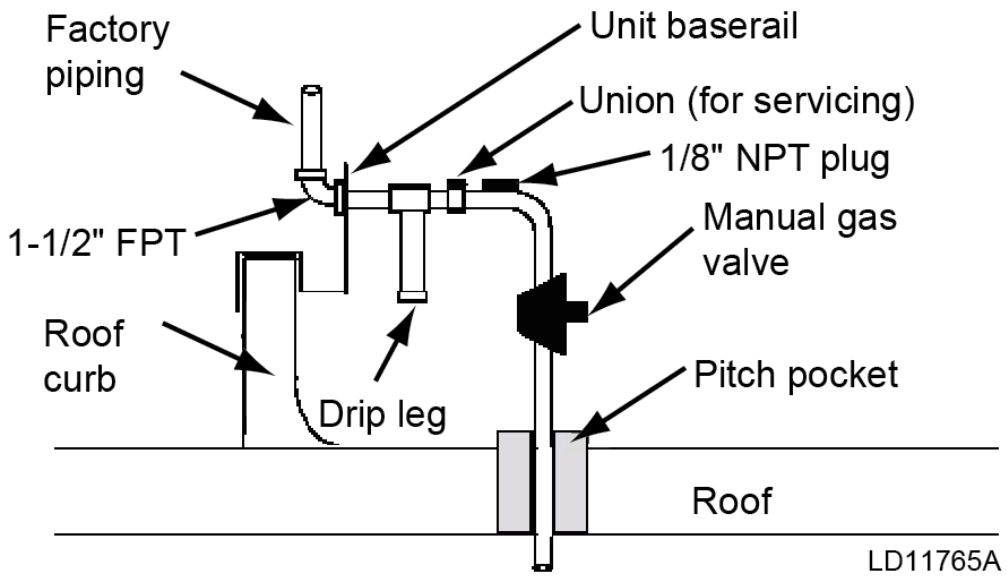
The heating value of the gas may differ with locality. The value should be checked with the local gas utility.

ⓘ **Note:** There may be a local gas utility requirement specifying a minimum diameter for gas piping. All units require a 1 1/2 in. pipe connection at the entrance fitting. Line size should not be sized smaller than the entrance fitting size.

Gas connection

The gas supply line should be routed within the space and penetrate the roof at the gas inlet connection of the unit. Many local codes require that a shut off valve be located external to the unit. In these cases it is easier to run the gas piping on the roof and enter the unit through the side of the base rail. Typical supply piping arrangements are shown in Figure 14.

Figure 14: Typical gas piping connection



Gas piping recommendations

1. A drip leg and a ground joint union must be installed in the gas piping.
2. When required by local codes, a manual shut-off valve has to be installed outside of the unit.
3. Use wrought iron or steel pipe for all gas lines. Pipe dope should be applied sparingly to male threads only.

⚠ WARNING

Natural gas may contain some propane. Propane being an excellent solvent will quickly dissolve white lead or most standard commercial compounds. Therefore, a special pipe dope must be applied when wrought iron or steel pipe is used. Shellac base components such as Gaskolac or Stalastic, and compounds such as Rectorseal #5, Clyde's or John Crane may be used.

4. All piping should be cleaned of dirt and scale by hammering on the outside of the pipe and blowing out the loose particles. Before initial start-up, be sure that all of the gas lines external to the unit have been purged of air.
5. The gas supply should be a separate line and installed in accordance with all safety codes as prescribed under the limitations listed in the beginning of Position damper of this manual. After the gas connections have been completed, open the main shutoff valve admitting gas pressure to the mains. Check all joints for leaks with soap solution or other material suitable for the purpose. **NEVER USE A FLAME!**
6. The furnace and its individual manual shut-off valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of 0.5 PSIG.

⚠ WARNING

Disconnect gas piping from unit when leak testing at pressures greater than 0.5 PSIG. Pressures greater than 0.5 PSIG will cause gas valve damage resulting in a hazardous condition. If gas valve is subjected to pressure greater than 0.5 PSIG, it must be replaced.

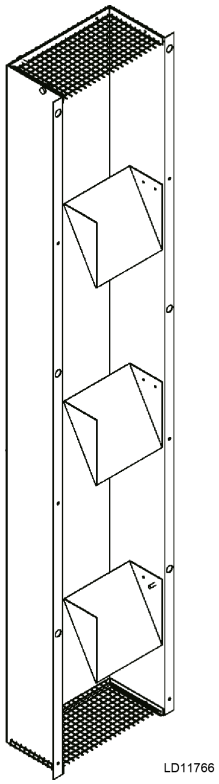
7. A 1/8 in. N.P.T plugged tapping, accessible for test gage connection, must be installed immediately upstream of the gas supply connection to the furnace.

Combustion vent

About this task:
The combustion vent assembly is shipped in the return air section of the unit. The combustion vent assembly must be mounted over the flue gas outlet fixed panel located to the right of the gas heat access door. Install as follows:

1. Remove the combustion vent assembly from the return compartment.
2. Remove the vertical row of six screws on either side of the flue gas outlet fixed panel.
3. Mount the combustion vent assembly over the flue gas outlets and attach to the gas outlet fixed panel using the screws removed in step 2.
4. See Figure 15 for the proper orientation of the combustion vent. The internal baffle(s) must direct the flue gases upward.

Figure 15: Combustion vent



Start-up

CAUTION

To protect warranty, this equipment must be installed and serviced by an authorized YORK service mechanic or a qualified service person experienced in air handling and condenser unit installation. Installation must comply with all applicable codes, particularly in regard to electrical wiring and other safety elements such as relief valves, HP cut-out settings, design working pressures and ventilation requirements consistent with the amount and type of refrigerant charge. Lethal voltages exist within the Control Panel. Before servicing, open and tag all disconnect switches. Reference *YORK 50 Ton to 150 Ton Rooftop Unit Start-Up Guide (YRK-SU1)* for additional information.

Crankcase heaters

With power applied to the rooftop unit, the crankcase heater for each compressor is ON whenever the compressor is not running. The heater is interlocked into the compressor motor contactor and is not controlled by the microprocessor.

The purpose of the crankcase heater is to prevent the migration of refrigerant to the crankcase during shutdown, assuring proper lubrication of the compressor on start-up.

Anytime power is removed from the unit for more than an hour, the crankcase heater should be left ON for 24 hours prior to start.

CAUTION

Power must be applied to the rooftop unit 24 hours prior to starting the unit compressors. Failure to observe this requirement can lead to compressor damage and voiding of the compressor warranty.

Checking the system prior to initial start (no power)

Unit checks

1. Inspect the unit for shipping or installation damage.
2. Visually check for refrigerant piping leaks.
3. The compressor oil level should be maintained so that an oil level is visible in the sight glass. The oil level can only be tested when the compressor is running in stabilized conditions, guaranteeing that there is no liquid refrigerant in the lower shell of the compressor. In this case, the oil must be between 1/4 and 3/4 in the sight glass. At shutdown, the oil level can fall to the bottom limit of the oil sight glass.
4. Check the control panel to assure it is free of foreign material (such as wires and metal chips).
5. Visually inspect field wiring (power and control). Wiring MUST meet N.E.C. and local codes.
6. Check tightness of terminal lugs inside the power panel on both sides of the contactors, overloads, fuses, and power connections.
7. Verify fuse sizing in main circuits.
8. Verify field wiring for thermostat (if applicable), optional zone sensor, and so on.

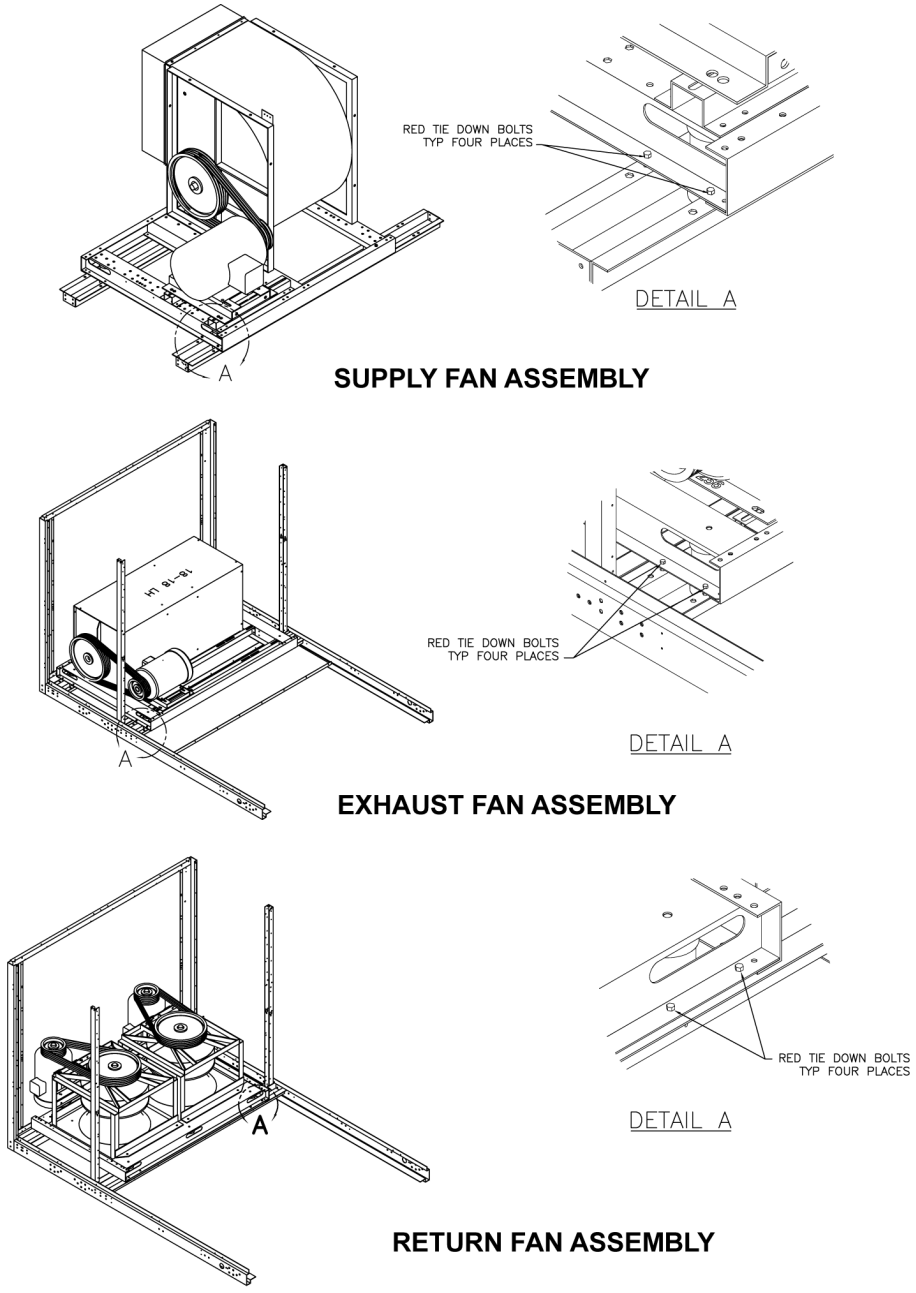
9. Verify all applicable pneumatic tubing has been field installed for duct static pressure transducers (VAV units), optional building pressure transducer for power exhaust option, and outdoor static pressure prove.
10. Supply fan isolators spring bolts removed (refer to Figure 16).
11. Verify proper bearing and locking collar torque values on supply and exhaust fans (refer to Maintenance of this manual).
12. Verify proper drive alignment of supply and exhaust fans (refer to Maintenance of this manual).

⚠ CAUTION

The supply, exhaust and return fans have tie down bolts installed at the factory to prevent movement in the fan assemblies during shipment. THESE HOLD DOWN BOLTS MUST BE REMOVED PRIOR TO OPERATION OF THE ABOVE FANS. There are eight bolts per assembly two at each comer of the fan skids, front and rear. The bolt locations are shown in Figure 16. The bolt heads are red in color and a label identifies their location in the unit.

13. Verify proper belt tension of supply fan, exhaust fan or return fan (refer to Maintenance of this manual). Belts must be checked after 24 hours of initial operation.
14. Manually rotate condenser fan blades, supply exhaust and return blower wheels and motors, to assure freedom of movement.
15. Verify proper condensate drain trap installation (refer to Figure 16). Fill traps with water prior to unit start-up.

Figure 16: Fan isolator spring bolts (total of 8)



16. If applicable, verify installation of air filters (refer to Installation of this manual for size and quantity).
17. Verify variable frequency drive (VFD) setpoints for variable air volume (VAV) units and optional VFD Exhaust or Return Fans. Both VFDs are located in the supply blower section of the unit.
18. If equipped, open suction line ball valve, discharge line ball valve, and liquid line ball valve for each refrigerant system.

Unit checks – power applied

1. Apply three-phase power and verify its value. Voltage imbalance should be no more than 2% of the average voltage.
2. Verify programmed units setpoints (refer to *Quick Start-Up Guide (Form 100.50-SU1)*).
3. Verify correct fan rotation (fan should rotate in direction of arrow on fan housing).
4. Insure proper compressor rotation. See the following Verifying compressor rotation.

Verifying compressor rotation

⚠ CAUTION

This unit uses scroll compressors, which only operate in one direction. Failure to observe these steps could lead to compressor failure.

The packaged rooftop unit uses hermetic scroll compressors, which only pump in one direction. Therefore, it is necessary to verify proper rotation at unit start-up. Operation of the compressor in the reverse direction will not produce any capacity, and cause the compressor to cycle on internal overload. Operating the compressor in reverse for extended periods can result in failure of the compressor.

To verify proper rotation, monitor the suction and discharge pressures of the respective refrigerant circuit while the compressor cycles ON. If the discharge pressure increases and suction pressure decreases as the compressor cycles ON, the compressor is properly phased and operating in the correct rotation.

Suction and discharge pressure may be monitored with the user Interface if the optional suction and discharge pressure transducers are installed (for menu navigation, refer to User interface control center). If the optional transducers are not installed, pressures must be monitored with a manifold gauge connected to the service valves located on the suction and discharge lines.

Compressor oil level check

The oil level can only be tested when the compressor is running in stabilized conditions, to ensure that there is no liquid refrigerant in the lower shell of the compressor. When the compressor is running in stabilized conditions, the oil level must be between 1/2 and 3/4 in the oil sight glass.

ⓘ **Note:** At shutdown, the oil level can fall to the bottom limit of the oil sight glass.

Initial start- up

About this task:
After all of the preceding checks have been completed and the control panel has been programmed as required, the unit may be placed into operation by performing the following:

1. Place the unit switch in the control panel to the ON position.
2. With a demand, the supply fan cycles ON, and permits compressor operation if the air is proving.
3. The first compressor starts. After several minutes of operation, a flow of refrigerant is noted in the sight glass, the vapor in the sight glass will clear, and there should be a solid column of liquid visible in the sight glass when the TXV stabilizes.
4. Allow the compressor to run a short time, being ready to stop it immediately if any unusual noise or adverse conditions develop.

5. Check the system operating parameters by checking evaporator superheat and condensing subcooling.
    a. Connect a gauge manifold set to the Schrader service valve connections on the liquid and common suction line in the condensing section of the unit.
    b. After the system is running and the pressures have stabilized, measure the temperature at the liquid and common suction lines near the Schrader service valves.
    c. Calculate evaporator superheat and condensing subcooling. Both should be approximately 15.0°F (-9.4°C). Refer to Checking superheat and subcooling for information on how to calculate evaporator superheat and condenser subcooling.
    d. Repeat the above process for each of the refrigerant systems.
6. With an ammeter, verify that each phase of the condenser fans, compressors, supply fan, and exhaust fan are within the RLA or FLA as listed on the unit data plate.

Refrigerant charge

This rooftop unit comes fully charged from the factory with refrigerant R-410A as standard.

Checking superheat and subcooling

An R-410A temperature and pressure chart lists the associated saturation temperature in one column, with the associated pressure in another column. As a result, only one temperature/ pressure column is needed to show the relationship.

Subcooling (R-410A)

When the refrigerant charge is correct, there is no vapor in the liquid sight glass with the system operating under full load conditions.

The subcooling temperature of each system can be calculated by recording the temperature of the liquid line at the outlet of the condenser and subtracting it from the saturation temperature listed in Table 12, for the corresponding discharge pressure.

Example:

On a YPAL070 the liquid pressure is 375 PSIG and the liquid temperature is 97.0°F.

Saturation Temperature for 375 PSIG = 112.0°F

Minus the liquid line temp = 97.0°F

Liquid Line Subcooling of = 15.0°F

The subcooling should be 15.0°F at design conditions.

Superheat (R-410A)

The superheat should be checked only after steady state operation of the unit has been established, the discharge air temperature has been pulled down to within the control range, and the unit is running in a fully loaded condition.

The superheat is calculated as the difference between the actual temperature of the refrigerant gas in the suction line and the temperature corresponding to the Suction Pressure as shown in Table 12.

Example:

The suction pressure is 130 PSIG and the suction line temperature is 57.0°F.

Suction Line Temperature = 57.0°F

Saturation Temperature for 130 PSIG = 45.0°F

Evaporator Superheat = 12.0°F

When adjusting the expansion valve, the adjusting screw should be turned not more than one turn at a time, allowing sufficient time (approximately 15 minutes) between adjustments for the system and the thermal expansion valve to respond and stabilize.

The superheat setting should be adjusted to 12.0°F at design conditions.

Table 12: R-410A pressure temperature chart

PSIG	Temp °F	PSIG	Temp °F
0	-60	78	20
2	-58	80	21
4	-54	85	24
6	-50	90	26
8	-46	95	29
10	-42	100	32
12	-39	105	34
14	-36	110	36
16	-33	115	39
18	-30	120	41
20	-28	125	43
22	-26	130	45
24	-24	135	47
26	-20	140	49
28	-18	145	51
30	-16	150	53
32	-14	160	57
34	-12	170	60
36	-10	180	64
38	-8	190	67
40	-6	200	70
42	-4	210	73
44	-3	220	76
46	-2	225	78
48	0	235	80
50	1	245	83
52	3	255	85
54	4	265	88
56	6	275	90
58	7	285	92
60	8	295	95
62	10	305	97
64	11	325	101
66	13	355	108
68	14	375	112
70	15	405	118
72	16	500	134
74	17	600	149
76	19	700	159

Leak checking

Leak check compressors, fittings and piping to assure no leaks. Verify the evaporator distributor tubes do not have bare copper touching each other or are against a sheet metal edge. If you are leak checking a unit charged with R-410A make sure the leak test device is capable of sensing refrigerant R-410A.

If the unit is functioning satisfactorily during the initial operating period, no safeties trip and the unit controls are functioning properly, the rooftop unit is ready to be placed into operation.

Gas heat models

Note: Installation of this furnace at altitudes above 2000 ft (610 m) shall be made in accordance with the *High Altitude Accessory Kit Installation Instructions (100.50-N16)* available with this furnace.

Note: L'installation de ce générateur de chaleur à des altitudes supérieures à 610 m (2000 pi) doit être effectuée conformément aux *instructions d'installation du kit d'accessoires de haute altitude (100.50-N16)* fournie avec cet appareil.

WARNING

ELECTRICAL SHOCK, FIRE, OR EXPLOSION HAZARD Failure to follow safety warnings exactly could result in dangerous operation, serious injury, death, or property damage. Improper servicing could result in dangerous operation, serious injury, death, or property damage.

Note:

- Before servicing, disconnect all electrical power to furnace.
- When servicing controls, label all wires prior to disconnecting. Reconnect wires correctly.
- Verify proper oeration after servicing.

WARNING

RISQUE D'ÉLECTROCUTION, D'INCENDIE OU D'EXPLOSION Si les consignes de sécurité ne sont pas suivies à la lettre, cela peut entraîner la mort, de graves blessures, un fonctionnement dangereux ou des dommages matériels. Un entretien inadéquat peut entraîner la mort, de graves blessures, un fonctionnement dangereux ou des dommages matériels.

Note:

- Avant de faire l'entretien de l'appareil de chauffage, le débrancher de l'alimentation électrique.
- Avant l'entretien des commandes, étiqueter tous les fils avant de les déconnecter. Rebrancher correctement les fils.
- Vérifier que l'appareil fonctionne correctement aprés l'entretien.

WARNING

FIRE OR EXPLOSION HAZARD Failure to follow safety warnings exactly could result in serious injury, death, or property damage.

Note: Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

Note: WHAT TO DO IF YOU SMELL GAS:

- Do not try to light any appliance.
- Do no touch any electrical switch; do not use any phone in your building.
- Leave the building immediately.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department. Installation and service must be performed by a qualified installer, service agency, or the gas supplier.

WARNING

RISQUE D'INCENDIE OU D'EXPLOSION Si les consignes de sécurité ne sont pas suivies à la lettre, cela peut entraîner la mort, de graves blessures ou des dommages matériels.

Note: Ne pas entreposer ni utiliser d'essence ni autres vapeurs ou liquides inflammables à proximité de cet appareil ou de tout autre appareil.

Note: QUE FAIRE SI UNE ODEUR DE GAZ EST DÉTECTÉE:

- Ne mettre en marche aucun appareil.
- Ne toucher aucun interrupteur électrique; ne pas utiliser de téléphone dans le bâtiment.
- Quitter le bâtiment immédiatement.
- Appeler immédiatement le fournisseur de gaz en utilisant te téléphone d'un voisin. Suivre les instructions du fournisseur de gaz.
- Si le fournisseur de gaz n'est pas accessible, appeler le service d'incendie. L'installation et l'entretien doivent être effectués par un installateur ou une entreprise d'entretien qualifié, ou le fournisseur de gaz.

WARNING

FIRE OR EXPLOSION HAZARD Failure to follow safety warnings exactly could result in serious injury, death, or property damage. Never test for gas leaks with an open flame. Use a commercially available soap solution made specifically for the detection of leaks to check all connections. A fire or explosion may result causing property damage, personal injury, or loss of life.

WARNING

RISQUE D'INCENDIE OU D'EXPLOSION Si les consignes de sécurité ne sont pas suivies à la lettre, cela peut entraîner la mort, de graves blessures ou des dommages matériels. Ne jamais vérifier la présence de fuites de gaz au moyen d'une flamme nue. Vérifier tous les raccords en utilisant une solution savonneuse commerciale conçue spécialement pour la détection de fuites. Un incendie ou une explosion risque de se produire, ce qui peut entraîner la mort, des blessures ou des dommages matériels.

Pre-start checks

Startup of gas heat includes verification of incoming gas line pressure and leak checks of the field installed gas lines, these items are the responsibility of the installing contractor; however, they should also be verified prior to unit start-up. Correct values and the proper procedures are described later in this section of the manual.

Verify wiring inside the burner compartment to insure the wiring/terminals are tight and securely connected to the components, such as the ignition control, flame sensor, gas valve, rollout switches and igniter.

The gas heat start up sequence begins with a 30 second prepurge. The next step in the sequence is the closure of the air proving switch. The heat section has a combustion air-proving switch. This switch must close before the ignition sequence can initiate. If the air-proving switch is closed after the 30 second prepurge the ignition control will energize the spark igniter and open the gas valve.

The furnace ignition control uses flame rectification as verification of burner operation. The minimum allowable flame current for operation is 0.7 DC microamps.

If the furnace ignition control does not prove flame in 7 seconds, it will turn off the spark signal and close the gas valve. It will wait 30 seconds and then initiate a second ignition sequence. If flame is not proven during the second 7 second trial for ignition the control will turn off the spark signal, close the gas valve, wait 30 seconds and initiate a third ignition sequence. If flame rectification is not proven on the third try, the ignition control will lock out.

The heat section has two roll out switches mounted above the burners. The purpose of the roll out switch is to protect the gas heat section from flame roll out, flame burning outside the heat exchanger. A restriction in the heat exchanger or breach in the flue passages could result in a roll out situation. The roll out switch is a manual reset device.

The unit has two high temperature limit switches. One located at the heat exchanger vestibule panel and the other located in the area of the heat exchanger return bend. These limits are automatic reset devices. If the limit opens the ignition control will de-energize the gas valve. On staged gas heat, as soon as the limit closes the ignition control will re-initiate the ignition sequence. If the limit opens on a modulating gas heat section the IPU board locks out the heat section.

The control circuit is tested in the factory to insure that all of these steps are followed, however, natural gas is not actually introduced to the system in the plant; nitrogen is used in its place.

Post start checks

When a signal is received at the gas heat control module from the IPU board, verify:

- Combustion blower starts and runs for 30 seconds before the spark is initiated.
- Spark igniter sparks.
- Gas valve opens.
- Burners light from right to left, in a 2 1/2 second time frame.
- Each burner lights in sequential order from right to left; and establishes stable flame immediately upon ignition.
- No gas leaks in the unit piping as well as the supply piping.
- Correct manifold gas pressures. See Manifold gas pressure adjustment.
- The supply pressure is adequate. It must be within the limitations shown in Table 13.
- The flame is stable, with the flame present only at the end of the burner and that there is not any burning occurring inside the burner.

ⓘ **Note:** Supply pressure should be checked with all gas appliances in the building at full fire. At no time should the standby gas pressure exceed 10.5 in. w.c. or the operating pressure drop below 4.5 in. w.c. for natural gas or the standby gas pressure exceed 13.0 in. w.c. or the operating pressure drop below 11.0 in. w.c. for propane. If the gas pressure is outside these limits, contact the installing mechanical contractor for corrective action.

ⓘ **Note:** There should be a little yellow tipping of the flame.

ⓘ **Note:** There may be some smoke through the flue, due to tooling oil burning off of the heat exchanger tubing.

Table 13: Low fire / high fire - staged

Type of gas	Line pressure		Manifold pressure	
	Min (in. w.c.)	Max (in. w.c.)	LO fire +/- 0.3 (in. w.c.)	HI fire /- 0.3 (in. w.c.)
Natural	4.5	10.5	1.4	3.5
Propane	11.0	13.0	4.2	10.0

Table 14: Low fire / high fire - modulating

Type of gas	Line pressure		Pressure to maxitrol valve	
	Min (in. w.c.)	Max in. w.c.)	LO fire +/- 0.3 (in. w.c.)	HI fire+/- 0.3 (in. w.c.)
Natural	4.5	10.5	1.4	3.5
Propane	11.0	13.0	4.2	10.0

Manifold pressure – modulating gas

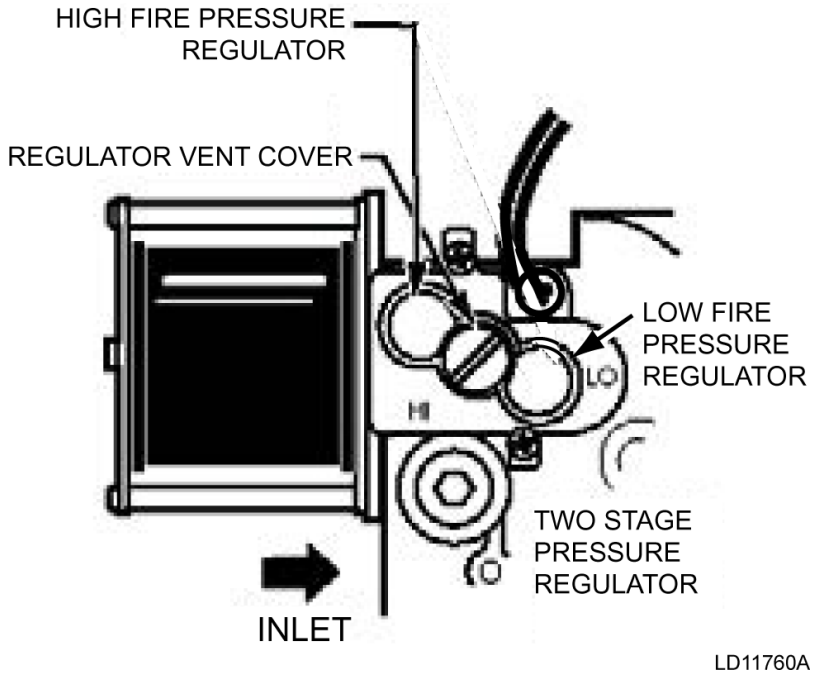
Table 15: Low fire (inducer fan on low, 1.4 in. w.c. input to maxitrol valve)

Input voltage to signal conditioner (VDC)	Manifold pressure (in. w.c.)
0.0	0.22
0.5	0.22
1.0	0.22
1.5	0.22
2.0	0.22
2.5	0.32
3.0	0.45
3.5	0.66
4.0	0.84
4.5	1.05
5.0	1.25
5.5	1.30
6.0	1.30
6.5	1.30

Table 16: High fire (inducer fan on high, 3.5 in. w.c. input to maxitrol valve)

Input voltage to signal conditioner (VDC)	Manifold pressure (in. w.c.)
4.0	1.10
4.5	1.40
5.0	1.70
5.5	2.10
6.0	2.50
6.5	2.90
7.0	3.15
7.5	3.25
8.0	3.30
8.5	3.30
9.0	3.30

Figure 17: Manifold gas pressure adjustment



Manifold gas pressure adjustment

About this task:
Small adjustments to the manifold gas pressure can be made by following the procedure outlined below. Refer to Figure 17 for the high and low fire pressure regulator adjustment locations.

1. Turn the gas OFF to the unit.
2. Use a 3/16 in. Allen wrench to remove the 1/8 in. NPT plug from the outlet pressure tap of the valve.
3. Install a brass adapter to allow the connection of a hose to the outlet pressure tap of the valve.
4. Connect the hose to a manometer capable of reading the required manifold pressure value.

5. Turn the gas back ON.
6. Place the heat section into high fire operation.
7. Compare the high fire manifold pressure to Table 13.
8. To adjust the high fire manifold pressure remove the cap from the high fire pressure regulator. Use a 3/32 in. Allen wrench to make the manifold pressure adjustment. To increase the manifold pressure, turn the screw clockwise; to decrease the manifold pressure, turn the screw counterclockwise. Place your finger over the adjustment opening while verifying the manifold pressure.
9. Place the heat section into low fire operation.
10. Compare the low fire manifold pressure to Table 13.
11. To adjust the low fire manifold pressure remove the cap from the low fire pressure regulator. Use a 3/32 in. Allen wrench to make the manifold pressure adjustment. To increase the manifold pressure, turn the screw clockwise; to decrease the manifold pressure, turn the screw counterclockwise. Place your finger over the adjustment opening while verifying the manifold pressure.
12. Turn the heat OFF.
13. Turn the gas OFF.
14. Remove the brass tubing adapter and replace the plug in the outlet pressure tap.

Table 17: Gas heat performance data

Unit	Gas input capacity (BTU/HR X 1000)	Maximum output capacity (BTU/HR X 1000)	Airflow		Temp. rise (°F)
			Min.	Max.	
70-85	375	300	6,950	27,750	10-40
	750	600	11,150	27,750	20-50
	1125	900	15,150	33,325	25-55
90-105	375	300	6,950	27,750	10-40
	750	600	11,150	27,750	20-50
	1125	900	15,150	33,325	25-55

Maintenance

⚠ WARNING

Make sure power is removed from the unit before performing the maintenance items contained in this section of the manual.

General

A planned program of regularly scheduled maintenance will return dividends by averting possible costly and unexpected periods of down time. It is the responsibility of the owner to provide the necessary maintenance for the air handling units and coils. If a system failure occurs due to improper maintenance during the warranty period, YORK will not be liable for costs incurred to return the unit to satisfactory operation.

Periodic maintenance – monthly

Filters

Check the cleanliness of the filters and replace or clean as required.

Linkages

Examine the damper and operator linkages to insure that each is free and operating smoothly.

Compressors

Oil Level Check: The oil level can only be tested when the compressor is running in stabilized conditions, to ensure that there is no liquid refrigerant in the lower shell of the compressor. When the compressor is running in stabilized conditions, the oil level must be between 1/4 and 3/4 in the oil sight glass. Note: at shutdown, the oil level can fall to the bottom limit of the oil sight glass.

Oil Analysis: Use YORK Type T POE oil (clear) for units charged with R-410A refrigerant. The type of refrigerant and amount per system is listed on the unit rating plate. A change in the oil color or odor may be an indication of contaminates in the refrigeration system. If this occurs, an oil sample should be taken and analyzed. If contaminations are present, the system must be cleaned to prevent compressor failure. This can be accomplished through the installation of oversized suction and liquid line driers. The driers may have to be changed several times to clean up the system depending on the degree of contamination.

⚠ CAUTION

Never use the scroll compressor to pump the refrigerant system down into a vacuum. Doing so will cause internal arcing of the compressor motor, which will result in failure of compressor.

Fan bearing lubrication

Add grease slowly with shaft rotating until a slight bead forms at the seals. If necessary, relubricate while bearing is stationary. The fan data plate (attached to the fan scroll) lists the type of grease that must be used for lubricating the bearings. Refer to Table 18 for lubricating schedule.

Relubrication is generally accompanied by a temporary rise in operating temperature. Excess grease is purged at seals.

Table 18: Fan bearing – lubrication intervals

Relubrication schedule (months) ball bearing pillow blocks									
Speed (RPM)	**500**	**1000**	**1500**	**2000**	**2500**	**3000**	**3500**	**4000**	**4500**
Shaft Dia									
1/2 in. to 1 11/16 in.	6	6	5	3	3	2	2	2	1
1 15/16 in. to 2 7/16 in.	6	5	4	2	2	1	1/2	1/4	1/4
2 11/16 in. to 2 15/16 in.	5	4	3	2	1	1/2	1/2		
3 7/16 in. to 3 15/16 in.	4	3	2	1	1/2	1/2			

Recommended lubricant for fan bearings

A Lithium / Petroleum base grease conforming to an NLGI Grade II consistency is normally used. Lubricant must be free of any chemical impurities such as free acid or free alkali, dust, rust, metal particles or abrasive. This light viscosity, low torque grease is rust inhibited and water resistant, has a temperature range of -30.0°F to +200.0°F with intermittent highs of +250.0°F. Lubricate bearings as required by the severity of required duty.

Condenser coils

Dirt should not be allowed to accumulate on the condenser coil surfaces. Cleaning should be as often as necessary to keep coil clean.

If the coil needs to be cleaned, it should be washed with water or with non-acidic Calgon Coilclean (mix one part Coilclean with seven parts water). Allow the Coilclean solution to remain on the coil for 30 minutes before rinsing with water. The solution should not be allowed to come into contact with painted surfaces. Do not use pressurized water greater than that found in common garden hose/pressure nozzle equipment. Use of a high pressure power washer to clean the coil will damage the coil and could result in poor system performance or system failure.

Periodic maintenance – three to six months

DANGER

Disconnect and lock-out power from the unit anytime service is being performed on the fan section. Failure to do so could result in serious injury or death due to the fan turning ON ***while work is in progress.***

CAUTION

Squealing belts during starting is caused by slipping belts that are not tensioned properly.

Motor bearing lubrication

Bearings must be re-lubricated periodically to assure long life. Motor bearing should be lubricated yearly, but may need lubrication more frequently, depending on severe operating conditions.

Belt tension

Adjust the belt tension if necessary. Required belt tension data is supplied on the fan skid data plate, attached to the fan housing. Never use a belt dressing on the belts. If belts slip with the proper tension, use a good grade of belt cleanser to clean the belts. Refer to Figure 18.

⚠ CAUTION

Never use excessive belt tension, as this could result in damaging the bearing, motor pulleys or motor base. See drive label on fan housing adjacent to drive for specific details on tension.

When it is necessary to replace one belt in a given set, the entire set of belts must be replaced.

Periodic maintenance – yearly

Check the fan wheels and inspect the drain pan for sludge and foreign material. Clean if required.

Observe the operation of all dampers and make any necessary adjustments in linkage and blade orientation for proper operation.

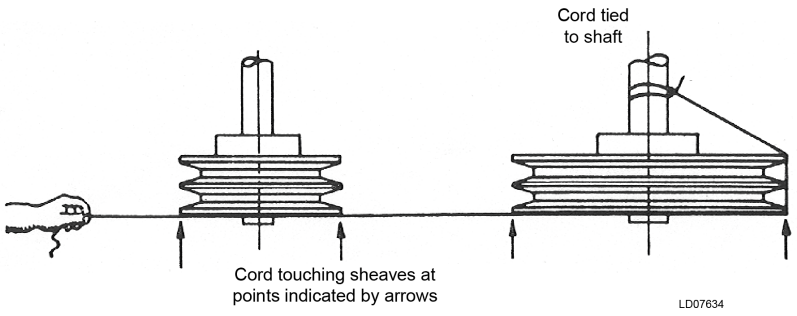
Entire unit inspection

In addition to the checks listed in this section of the manual, periodic overall inspections of the unit should be accomplished to ensure proper equipment operation. Items such as loose hardware, component operation, refrigerant leaks, unusual noises, etc. should be investigated and corrected immediately.

Sheave alignment

To check sheave alignment, a straight edge or a piece of string can be used. If the sheaves are properly aligned, the string or straight edge will touch at all points, as indicated in Figure 18. Rotating the sheaves will determine if the sheave is wobbly or the drive shaft is bent. Alignment error must be corrected to avoid bearing and belt failure.

Figure 18: Sheave alignment



Belts

New belts should be rechecked after 24 hours of operation. On multiple belt adjustable pulleys, the pitch depth should be checked to insure identical belt travel, power transfer and wear. Adjustable motor bases are provided for belt adjustment.

Motor pulleys and blower shaft pulleys are locked in position with either set screws or split taper lock bushings. All set screws and taper lock bolts must be checked for tightness and alignment before putting equipment into operation.

An incorrectly aligned and tensioned belt can substantially shorten belt life or overload blower and motor bearings, shortening their life expectancy. A belt tensioned too tightly can overload the motor electrical, causing nuisance tripping of the motor overloads and motor failure and shaft failure.

Belt replacement

About this task:
Always replace belts as a set. Follow the steps below to replace belts:

1. Release the tension on the belts by loosening the adjusting nuts on the fan motor.
2. Remove old belts and recheck the sheave alignment with a straight edge.
3. Install the new belts on the sheaves.

Result
Never place the belts on the sheaves by using a screwdriver to pry the belt over the rim of the sheave. This will permanently damage the belts.

Belt tensioning

Belt tension information is included on the fan skid data plate as shown in Figure 19. Sample data plate shows 4.3 lb pressure at .30 in. deflection.

A Browning Belt tension gauge is used in Figure 20 to properly tension belts.

Figure 19: Fan data plate - belt tension

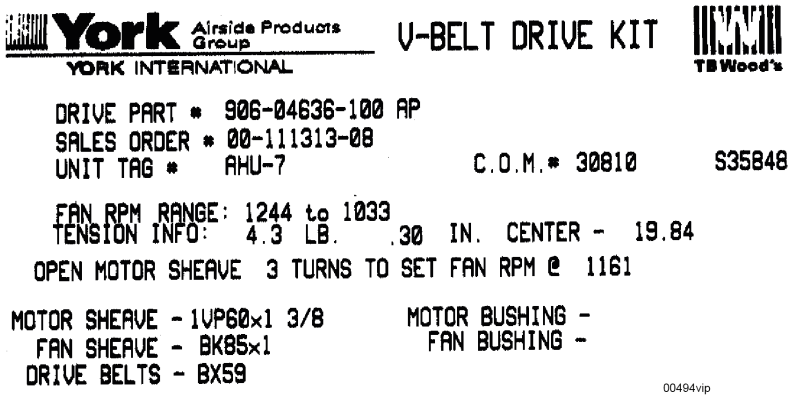
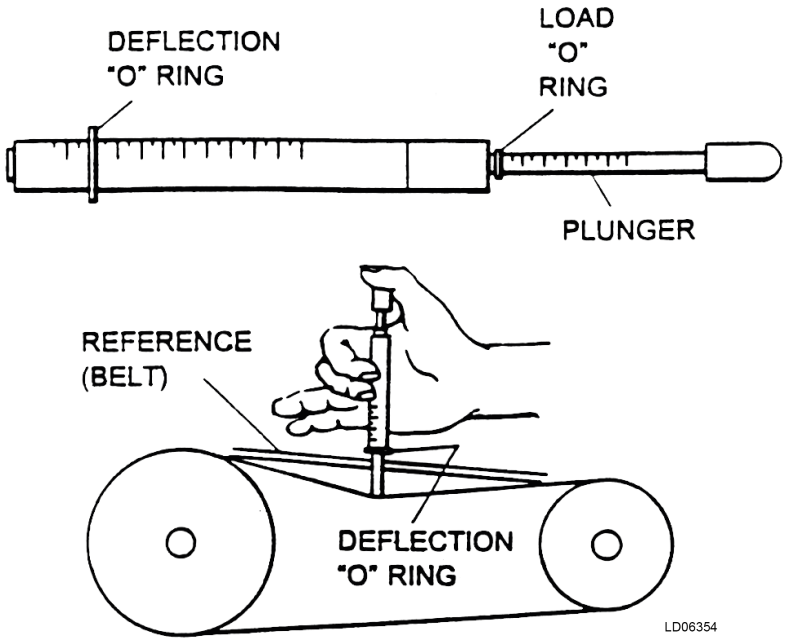


Figure 20: Belt tensioning gauge



Filter drier replacement

The filter drier should be replaced any time work is performed on the refrigerant circuit. The rooftop unit comes with sealed type (non-replaceable) cores as standard. If the unit is not equipped with the optional valve package (suction, discharge, and liquid line valves); the refrigerant will need to be recovered with a recovery machine to replace the filter drier.

If the unit is equipped with a valve package, the unit can be pumped down by closing the liquid line ball valve (prior to the filter drier) while the unit is running, initiating a unit pump-down. The unit will shut off when the mechanical low-pressure switch opens. When the unit shuts down, close the ball valve located after the filter drier and remove power from the unit to prevent the unit from running. When the filter drier core has been replaced, the filter drier section should be evacuated via the Schrader access valve located next to the filter drier prior to opening the ball valves and restoring the unit to normal operation.

⚠ WARNING

Never shut the discharge valve while the unit is running. Doing so could cause a rupture in the discharge line or components, resulting in death or serious injury.

⚠ CAUTION

Never close the suction line ball valve with the compressor running. Doing so will cause the compressor to pump-down into a vacuum and damage the compressor due to internal arcing.

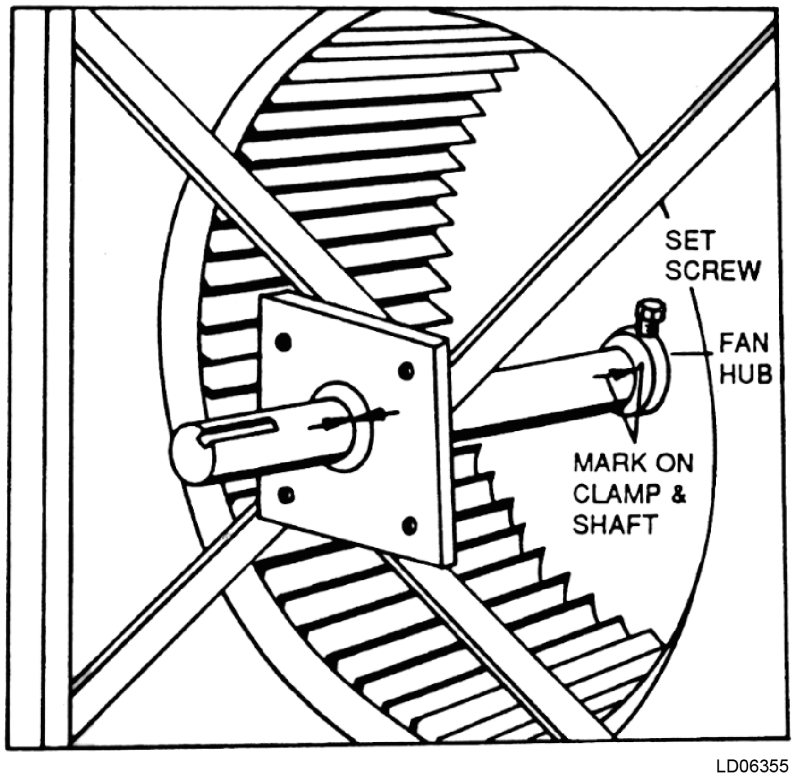
Forward curved fans

About this task:

The forward curved fan wheel must be removed through the fan discharge opening. The location of other clamps, fan wheel, and shaft must be marked so each of these components can be reassembled in the same location (see Figure 21). This will preserve the balance of the rotating assembly. Proceed with the following steps:

1. Disconnect all duct work or guards attached to the blower housing to permit unobstructed access.
2. Remove the cut off plate attached at the discharge or blast area of the blower housing.
3. Thoroughly clean the shaft of all grease and rust inhibitor. Be careful not to contaminate the bearing grease. Use emery cloth to remove all rust or the wheel may become locked to the shaft.
4. Loosen and remove set screws on both bearing locking collars. Inspect and, if necessary, replace.
5. Loosen and remove set screws from both sides of the wheel hub. Inspect and, if necessary, replace.
6. Using a rubber mallet or brass bar, slowly drive the shaft in one direction until the set screw marks on the shaft are fully exposed. File the marks completely smooth. Drive the shaft in the opposite direction and file smooth the set screw marks. Continue to clean the shaft of all dirt and residuals.
7. To remove the key, use a rubber mallet or brass bar to drive the shaft and wheel in one direction. Drive the key in the opposite direction using a nail set or smaller size key stock until the key is completely free of the wheel. Be sure that key does not get bent by allowing it to ride up the key way edge. The slightest bend will prevent quick assembly. Should this occur, replace the key stock.
8. Remove the shaft, supporting the weight of the wheel, particularly for larger diameter wheels. Do not allow the weight of the shaft to be supported by one bearing as you disassemble.
9. Remove the wheel through the discharge or outlet area of the blower housing.
10. Reassemble in reverse order, centering the wheel between the edges of the inlet venturi. If bearings were removed or replaced, be sure to reuse any shim stock found between the mounting support plate and bearing housings.
11. Torque all hardware.

Figure 21: Forward curved fan shaft/wheel marking



DANGER

Disconnect and lock-out power from the unit anytime service is being performed on the fan section. Failure to do so could result in serious injury or death due to the fan turning ON ***while work is in progress.***

Fan motor

1. Shut OFF unit power and lock out.
2. Disconnect and tag power wires at motor terminals.
3. Loosen motor base-to-mounting-rail attaching bolts.
4. Mark belt as to position. Remove and set aside belts.
5. Remove motor bracket hold down bolts.
6. Remove motor pulley and set aside.
7. Remove motor.
8. Install new motor. Reassemble by reversing steps 1 to 6. Be sure to reinstall multiple belts in their original position. Use a complete new set if required. Do not stretch belts over sheaves. Review the sections on motor and sheave installation, sheave alignment, and belt tensioning discussed previously in this manual.
9. Reconnect motor leads and restore power. Check fan for proper rotation as described in the Start-Up Checklist.

Fan shaft bearings

When removing and replacing the bearings, ensure that the area where the bearings fit on the shaft does not become scored or damaged. The shaft in this area should be thoroughly cleaned before the bearing is removed and again before the new bearing is installed.

Mounting details

1. Check the shaft. It should be straight, free of burrs and full size. Be sure the bearing is not seated on a worn section of shafting.
2. Make certain any set screws are not obstructing the bearing bore.
3. Align the bearing in its housing and slide the bearing into position on shaft (never hammer the ends of the inner race). If necessary, use a brass bar or pipe against the inner race to drift bearing into place (never hit the housing, as bearing damage may result). Make sure there is lubricant between the bearing outer ring and the housing.
4. Fasten the bearing housing to the unit mounting support with hex head cap screws, washers, new lock washers and hex nuts before securing the bearing to the shaft. This permits the bearing to align itself in position along the shaft and eliminates any possibility of cramping loads.
5. Rotate the shaft to make certain it turns freely.
6. Bearings may employ one of several different methods to lock the bearing to the shaft.

   ⓘ **Note:** Shaft should be free from burrs. If old shaft is used, be sure a ball bearing is not seated on worn section and shaft is not bent.

Result

There are various degrees of self-alignment in bearings of the same manufacturer. The force required for the self-alignment of the bearings used in YORK manufactured units has been specified and is closely monitored at the factory. If it is necessary to purchase a bearing locally, be sure it can be worked around in the housing with a short shaft made of wood or other soft material placed in the bearing.

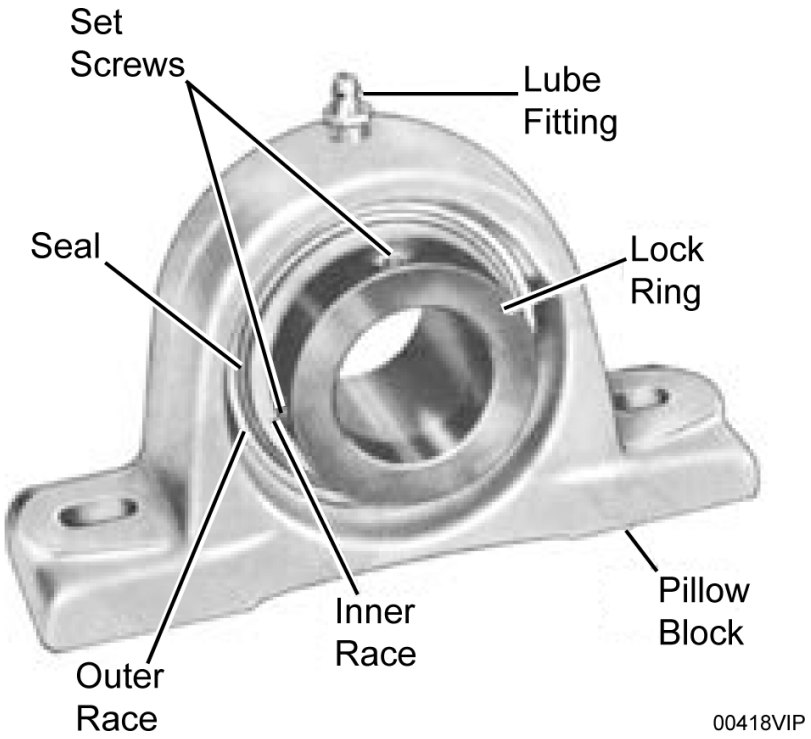
Prior to installing the bearing on the shaft, it should be worked around in the housing to make sure that self-alignment is obtained where the bearing is installed. After the shaft journal has been inspected for cleanliness, metal chips or burrs, the bearing is slipped, not forced, onto the shaft. Forcing the bearing onto the shaft by the use of flange, pillow block, or outer ring will damage the bearing internally. Force applied in this way transmits the load to the inner race through the balls in the bearing. Since the bearings are not designed for axial loading, the sides of the races in which the balls turn can be damaged. If the bearing cannot be made to slip onto the shaft by pressing on the inner ring of the bearing, check the shaft for burrs. Install the bearing so the part of the inner race, which receives the locking collar or contains setscrews, is toward the outside of the unit.

If the grease fitting must be changed on bearings that utilize a locking pin under the fitting, it is important to properly replace it. If an adapter or grease fitting of improper size and length is used, the locking pin may be either too tight or loose and can affect the alignment and re-lubrication of the bearing.

Bearing lock devices

Various types of locking devices are used to secure bearing(s) to the fan shaft. Refer to the instructions packed with bearings for special information. Figure 22 is a typical bearing with a setscrew-type locking device. The various locking devices can be classified under basic types: eccentric locking type, concentric locking type, and Skwezloc type.

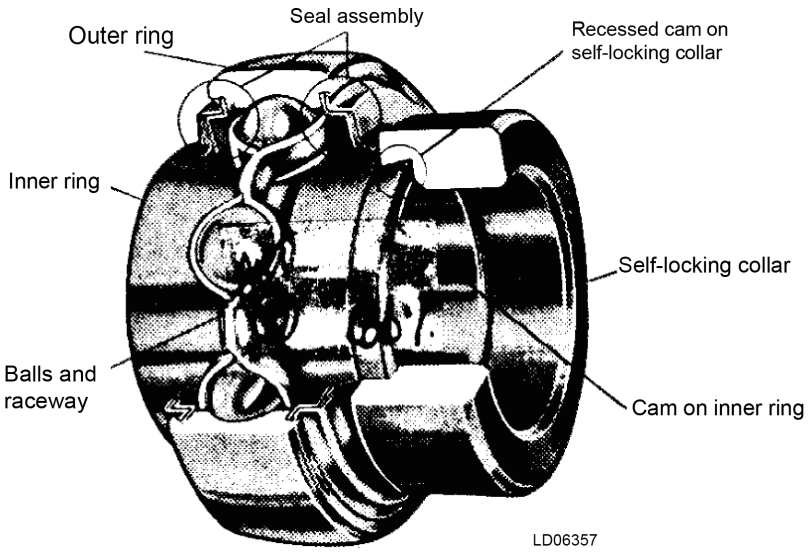
Figure 22: Bearing with setscrew type locking device



Eccentric type

An eccentric self-locking collar is turned and driven with a punch in the direction of shaft rotation to lock the bearing inner ring to the shaft. See Figure 24.

Figure 23: Bearing with eccentric cam



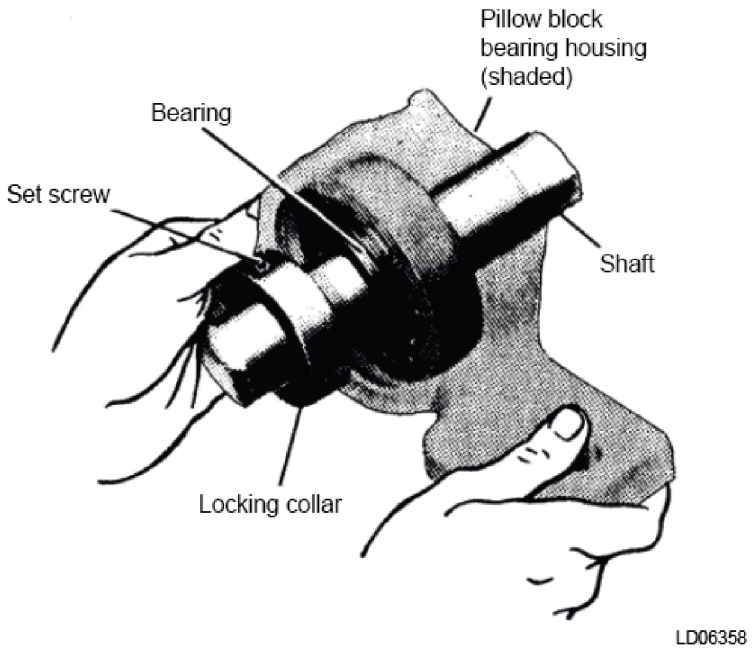
When the eccentric collar is engaged to the cam on the bearing inner ring and turned in direction of rotation, it grips the shaft with a positive binding action. The collar is then locked in place with the setscrew provided in the collar.

The self-locking collar is placed on the shaft with its cam adjacent to the cam on the end of the bearing's wide inner ring. In this position, with collar and bearing cams disengaged, the collar's bore is concentric with that of the bearing's inner ring. The wide inner ring is loose on the shaft. By turning the collar in the direction of normal shaft rotation, the eccentric recessed cam will drop over and engage with the corresponding cam on the bearing inner, causing it to grip the shaft tightly with a positive binding action. See Figure 24 and Figure 25. Make sure the two cams engage smoothly and the locking collar is down flat against the shoulder of the inner ring. The wide inner ring is now locked to the shaft. Using a punch or similar tool in the drilled hole of the collar, tap the tool lightly to lock the collar in the direction of normal shaft rotation.

As a final step, the setscrew is tightened. Torque per Table 19. It exerts a wedging action to hold the collar always in the engaged position, even under shock and reversing loads.

To disassemble, loosen the setscrew and tap the collar in the direction opposite shaft rotation.

Figure 24: Eccentric cam locking collar bearing installation



⚠ CAUTION

Do not apply excessive force to the bearing housing (pillow block or flange) when installing the bearing on the shaft.

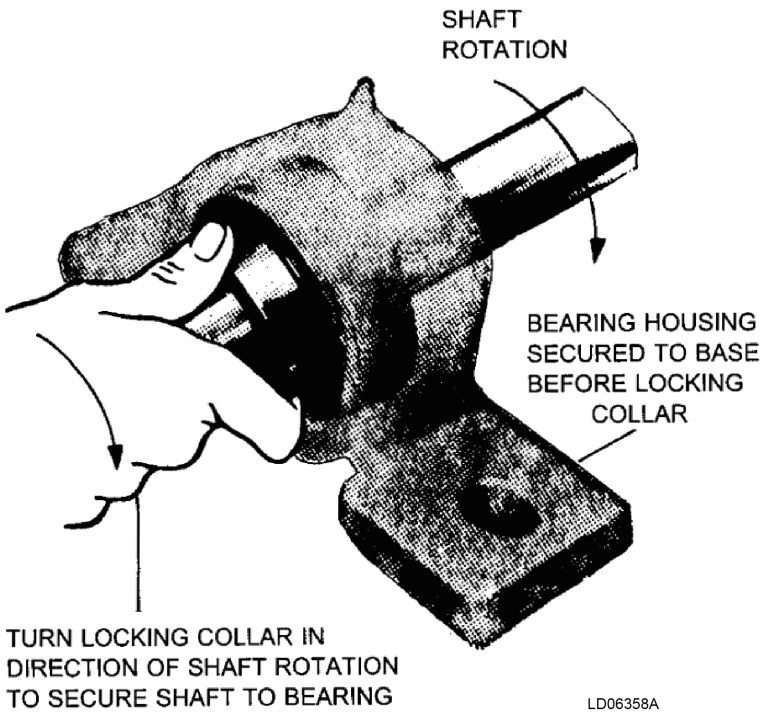


Table 19: Set screw torque

Set screw diameter	Hex. size across flats lb	Min. recommended torque	
		In. lb	Ft lb
1/4 1/8	66 - 85	5.5 - 7.2	-
5/16	5/32	126 - 164	10.5 - 13.7
3/8 3/16	228 - 296	19.0 - 24.7	-
7/16	7/32	348 - 452	29.0 - 37.7
1/2 1/4	504 - 655	42.0 - 54.6	-
5/8 5/16	1104 - 1435	92.0 - 119.6	-

Torquing of set-screws

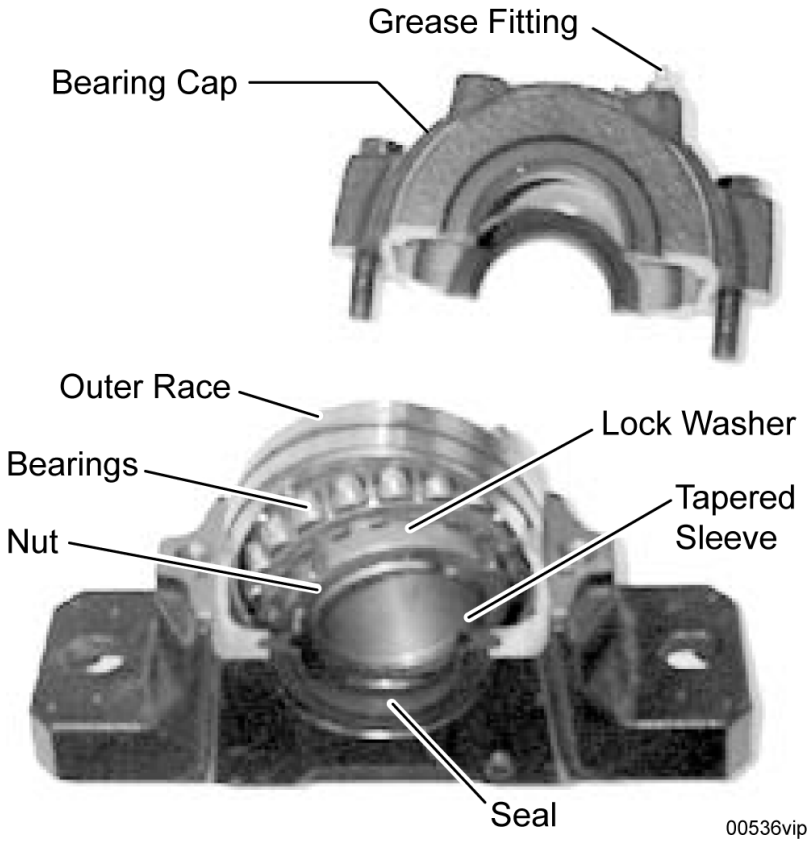
1. Torque screw A to half the recommended torque.
2. Torque screw B to the full minimum recommended value.
3. Torque screw A to the full recommended value.

⚠ CAUTION

After proper installation of the bearing(s), run the unit for 10 to 15 minutes. Shut the unit down and lock it out. Check for proper engagement of locking collar and tightness of set screw(s).

When replacing split bearings, refer to manufacturer's instruction provided with the bearing. It is extremely important to ensure that proper radial clearances are observed between the roller bearings and outer face. Failure to make proper adjustments will cause premature failure of the bearing.

Figure 25: Split bearing



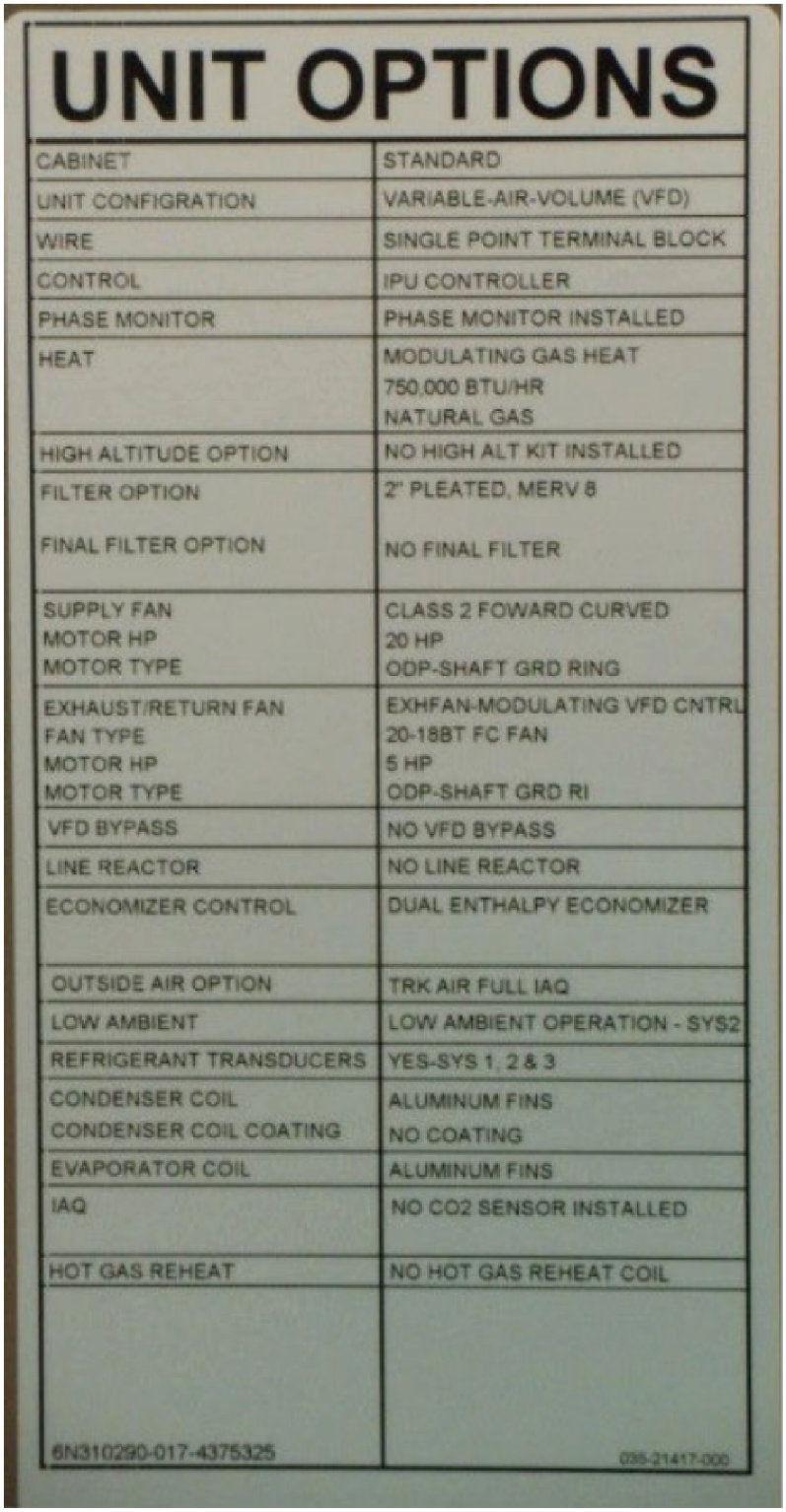
Sequence of operation

The rooftop unit is a sophisticated machine that is capable of performing many different functions. It can operate as three different unit types. It has many unit options with different sequences for each option.

Every rooftop unit has tandem compressors installed for mechanical cooling and a supply fan with a variable frequency drive (VFD). There is also a control panel installed with an IPU control board that contains the software necessary for unit operation. All other components are optional and are selected during the ordering process.

Locate the Unit Options tag (Figure 26) affixed to the unit to see what type of options were installed on the unit at the factory. Each of these different options and sequences are described in greater detail in this section.

Figure 26: Unit options



UNIT OPTIONS	
CABINET	STANDARD
UNIT CONFIGRATION	VARIABLE-AIR-VOLUME (VFD)
WIRE	SINGLE POINT TERMINAL BLOCK
CONTROL	IPU CONTROLLER
PHASE MONITOR	PHASE MONITOR INSTALLED
HEAT	MODULATING GAS HEAT 750,000 BTU/HR NATURAL GAS
HIGH ALTITUDE OPTION	NO HIGH ALT KIT INSTALLED
FILTER OPTION FINAL FILTER OPTION	2" PLEATED, MERV 8 NO FINAL FILTER
SUPPLY FAN MOTOR HP MOTOR TYPE	CLASS 2 FOWARD CURVED 20 HP ODP-SHAFT GRD RING
EXHAUST/RETURN FAN FAN TYPE MOTOR HP MOTOR TYPE	EXHFAN-MODULATING VFD CNTRL 20-18BT FC FAN 5 HP ODP-SHAFT GRD RI
VFD BYPASS	NO VFD BYPASS
LINE REACTOR	NO LINE REACTOR
ECONOMIZER CONTROL	DUAL ENTHALPY ECONOMIZER
OUTSIDE AIR OPTION	TRK AIR FULL IAQ
LOW AMBIENT	LOW AMBIENT OPERATION - SYS2
REFRIGERANT TRANSDUCERS	YES-SYS 1, 2 & 3
CONDENSER COIL CONDENSER COIL COATING	ALUMINUM FINS NO COATING
EVAPORATOR COIL	ALUMINUM FINS
IAQ	NO CO2 SENSOR INSTALLED
HOT GAS REHEAT	NO HOT GAS REHEAT COIL
6N310290-017-4375325	035-21417-000

LD28114

Note: To see a complete list of the OPTIONS, PROGRAMS, and SETPOINTS menus, as well as min/max values and factory defaults, refer to User interface control center.

Note: Refer to Service for a list of acronyms and abbreviations

Unit type

The rooftop unit can operate as three different unit types. The unit type can be viewed and selected through the OPTIONS-UNIT DATA menu in the user interface (UI).

These three unit types are selected in the ordering process of the unit and should not need to be changed in the field. Each of the unit types have different programming and sequences of operation. These different sequences are described in further detail throughout this section.

Variable air volume (VAV)

- A VAV unit type is an HVAC system that has VAV boxes installed in the ductwork. Typical VAV systems have overhead ductwork that provides conditioned air down to the space.
- A VAV unit has a supply fan controlled by a VFD that is capable of running at different speeds to maintain a constant duct static pressure.
- The VFD speed is controlled by a duct static pressure transducer that also provides high duct static pressure protection.

Single zone VAV (SZVAV)

- A SZVAV unit type is an HVAC system that has no VAV boxes installed in the duct work. SZVAV systems are replacing Constant Volume (CV) systems per ASHRAE 90.1-2010.
- A SZVAV configured unit has a supply fan, controlled by a VFD that is capable of running at different speeds according to a cooling/heating demand or supply fan only demand.
- Rooftop units ordered as SZVAV do not have a duct static pressure transducer installed.
- SZVAV configured units do not have the ability to control duct static pressure and have no high duct static pressure protection.

FlexSys™

- A FlexSys unit type is an HVAC system that utilizes an underfloor plenum to provide conditioned air up from the floor level instead of overhead like a traditional VAV system. The underfloor plenum may or may not have VAV boxes installed that control the amount of air to the space.
- A FlexSys system has a supply fan controlled by a VFD to maintain a constant duct static pressure.
- The VFD speed is controlled by a duct static pressure transducer that also provides high duct static pressure protection.
- A FlexSys configured unit also has a return air bypass duct installed that bypasses return air around the direct expansion (DX) evaporator coil and re-introduces this air at the supply fan inlet.

Unit overall status

- The rooftop unit UI displays an overall status at the top of the STATUS menu.
- This overall status can be used to determine if the status is normal or if there is a problem.
- All three unit types use the same-overall status messages.
- *Table 19* lists the different overall status messages.
- Press the HISTORY key on the UI to determine the active warnings or alarms.

Phase monitor

- Rooftop units have a 3 phase power monitor factory installed, except those units with dual point power.
- The phase monitor is wired in series between CTB1 terminal 4 and the unit control or rocker switch.
- It is factory set to the unit voltage, but slight field adjustment may be necessary.
- The location of the phase monitor varies per unit tonnage range.

Table 20: Overall status messages

Local-stop	Unit control switch is turned OFF
	No 24 VAC power to SD terminal on CTB1
	Power phase monitor is in a fault condition
	Building automation system (BAS) command to UNIT_STOP (AV93 or BV17)
Run	The unit is ready to RUN
Warning	The IPU board has recognized an Active Warning
Unit lockout	The IPU board has recognized and Active Alarm that has caused the unit to shut down
Unstable system	This message displays when the IPU board sees a significant drop in supply fan VFD speed. This is only applicable when the unit is twinned together with another unit
Smoke purge 1	This message shows the unit is operating in a Smoke Purge sequence. This specialized sequence is not normally used. Smoke Purge sequences are discussed later in this section
Smoke purge 2	This message shows the unit is operating in a Smoke Purge sequence. This specialized sequence is not normally used. Smoke Purge sequences are discussed later in this section
Smoke purge 3	This message shows the unit is operating in a Smoke Purge sequence. This specialized sequence is not normally used. Smoke Purge sequences are discussed later in this section

Note: * The control switch, SD terminal, and phase monitor are wired in series and provide 24 VAC to the I/O board. The SD terminal on CTB1 is where a remote shutdown device can be connected. A jumper is installed between 24 VAC and SD terminal from the factory.

Occupancy/unoccupancy determination

- The rooftop unit can operate in an Occ or Unocc mode.
- Occ and Unocc modes have different sequences for fan operation, cooling/heating operation, as well as ventilation and exhaust sequences.
- Unit occupancy is determined in the same manner for each of the three unit types.

Determining occupancy can be achieved in one of three ways. They are listed below in order of priority. If there is 24 VAC provided to the Occ terminal on CTB1, this overrides any occupancy commands from the Internal Clock Schedule or the BAS:

1. **Hardwired:** A 24 VAC input is provided to CTB1 at terminal Occ. Note that the 24 VAC MUST be provided by the rooftop unit. This is used with a device such as a timeclock or set of contacts from a field installed relay.
2. **Internal Clock Schedule:** The unit is programmed for Occ/Unocc times using the internal Time Clock.
3. **BAS Command:** A BAS provides an Occ/Unocc signal to the rooftop unit through a communicated command (*BACnet MS/TP point AV88* or *BV12 OCCUPNCY_CMD*).

Night set-back

- Night set-back allows for unocc cooling and heating of the rooftop unit.

- The IPU board must have a valid zone temperature reading for night set-back to operate.
- Night set-back works with all unit configurations.
- It is strongly recommended that if night set-back is used on VAV and FlexSys configured units, all VAV or underfloor boxes should be left open during the Unocc mode.

Night set-back setup

- Night set-back must be User Enabled in the PROGRAM-UNIT DATA menu (on older software versions, night set-back was located in the PROGRAM-HEATING menu and could only be User Enabled if the rooftop unit had a heating source installed).
- Unocc zone cooling/heating setpoints must be entered in the SETPOINTS-COOLING or SETPOINTS-HEATING menus.

Night set-back sequence of operation

- The unit is in the Unocc Standby mode.
- The current zone temperature becomes 0.5°F (-17.5°C) above the unocc zone cooling setpoint or 0.5°F (-17.5°C) below the unocc zone heating setpoint.
- The IPU board starts the supply fan. The supply fan is controlled per the unit configuration described later in this section.
- Once the air proving switch (APS) is made, the IPU board stages ON cooling or heating as determined by the current zone temperature.
- Cooling and heating operation is controlled per the unit configuration described later in this section.

Current operating mode

- The rooftop unit can operate in many different modes.
- Cooling and heating operation is determined in different ways for each unit type: SZVAV, VAV, or Flexsys.
- Comfort ventilation cooling and heating is described in the Comfort ventilation.
- Morning warm-up is described in the Heating sequences.
- Underfloor temperature override is described in the FlexSys setup.
- The current operating mode can be viewed in the STATUS menu.
- The IPU board monitors switching from a Standby mode to an Active Cooling or Heating mode. The unit must be in Standby mode for 3 minutes before switching to an Active Cooling or Heating mode.

Table 21: Current operating mode

Current operating mode	Unit type	Description
Occ Standby	ALL	There is no demand for cooling, heating, or dehumidification
Occ Cooling	VAV	There is a demand for cooling
Occ Cooling Low	SZVAV	There is a demand for low cooling
Occ Cooling High	SZVAV	There is a demand for high cooling
Occ Cooling without Bypass	FlexSys	There is a demand for cooling
Occ Cooling with Bypass	FlexSys	There is a demand for cooling
Occ Heating	VAV or FlexSys	There is a demand for heating
Occ Heating Low	SZVAV	There is a demand for low heating
Occ Heating High	SZVAV	There is a demand for high heating

Table 21: Current operating mode

Current operating mode	Unit type	Description
Unocc Standby	ALL	There is no demand for cooling, heating, or dehumidification
Unocc Cooling	VAV or FlexSys	There is a demand for cooling
Unocc Cooling Low	SZVAV	There is a demand for low cooling
Unocc Cooling High	SZVAV	There is a demand for high cooling
Unocc Heating	VAV or FlexSys	There is a demand for heating
Unocc Heating Low	SZVAV	There is a demand for low heating
Unocc Heating High	SZVAV	There is a demand for high heating
Comfort Ventilation Cooling	SZVAV	There is a demand for cooling
Comfort Ventilation Heating	SZVAV	There is a demand for heating
Morning Warm-Up	ALL	There is a demand for heating
Occ Dehumidification with Cooling	VAV or SZVAV	There is a demand for dehumidification
Occ Dehumidification Cool Low	VAV or SZVAV	There is a demand for low dehumidification
Occ Dehumidification Cool High	VAV or SZVAV	There is a demand for high dehumidification
Unocc Dehumidification with Cooling	VAV or SZVAV	There is a demand for dehumidification
Unocc Dehumidification Cool Low	VAV or SZVAV	There is a demand for low dehumidification
Unocc Dehumidification Cool High	VAV or SZVAV	There is a demand for high dehumidification

SZVAV

- An HVAC system that has no VAV boxes installed in the duct work operates as SZVAV.
- A SZVAV configured unit has a supply fan controlled by a VFD that is capable of running at different speeds according to a cooling/heating demand or supply fan only demand.
- Rooftop units ordered as SZVAV do not have a duct static pressure transducer installed.
- SZVAV configured units do not have the ability to control duct static pressure and have no high duct static pressure protection.
- SZVAV units can be controlled by either a standard thermostat (staged) input or a zone temperature input.

SZVAV setup

- Unit type must be set to SZVAV in the OPTIONS-UNIT DATA menu.
- Zone control method must be set in the PROGRAM-UNIT DATA menu.
- Single zone VAV minimum VFD speed must be set in the SETPOINTS-SUPPLY SYSTEM menu.
- Unit design airflow must be set in the SETPOINTS-UNIT DATA menu.
- Occ zone cooling setpoint must be set in the SETPOINTS-COOLING menu (zone control method is Wired or Comm Zone Temperature).
- 1st and 2nd stage cooling setpoints must be set in the SETPOINTS-COOLING menu.
- When the unit has a heating source installed:
    - Occ zone heating setpoint must be set in the SETPOINTS-HEATING menu (zone control method is wired or Comm Zone Temperature).
    - 1st and 2nd stage heating setpoints must be set in the SETPOINTS-HEATING menu.
- The IPU board must have a valid zone temperature reading if zone control method is set to Wired or Comm Zone Temperature.

Supply fan

- The supply fan must be running before any other unit operation is allowed.
- The IPU board monitors the status of an APS to determine the supply fan status.
- The APS must be closed, which proves supply fan status before cooling, heating, or any other operation is permitted.
- The supply fan is started whenever there is a demand for cooling or heating, regardless of occupancy.
- The supply fan can be operated continuously in the Occ mode if continuous ventilation is User Enabled in the PROGRAM-VENTILATION menu.
- The supply fan is started if zone control method is set to Staged and there is a demand for G terminal either from a thermostat or from the BAS.

Table 22: SZVAV supply fan speed

Status	Unit mode
Supply fan at SZVAV minimum speed	Occ Standby (continuous ventilation is User Enabled)
	Occ/Unocc Cooling Low
Supply fan speed is modulating up/down	Unit mode switches from Occ/Unocc Cooling Low to Occ/Unocc Cooling High
	At this point the supply fan speed starts to increase/decrease as the cooling demand increases/decreases
Supply fan speed at 100%	Occ Cooling High (see above)
	Unocc Cooling High (see Above)
	Occ Heating Low
	Occ Heating High
	Unocc Heating Low
	Unocc Heating High
	Comfort Vent Cool
	Comfort Vent Heat
	Morning Warm-Up
Supply fan is OFF	Occ Standby (continuous ventilation is User Disabled)
	Unocc Standby

Supply fan status

- The unit uses an APS to determine supply fan status.
- The APS is a diaphragm type switch that closes at approximately 0.30 iwg.
- The APS is mounted above the supply fan blower assembly.
- The APS senses the static pressure through a factory installed tube that passes through the supply fan wall into the next section of the unit.
- The APS needs to close and prove supply fan status within 45 seconds after the supply fan is commanded on.
- Failure to prove supply fan status within 45 seconds causes a Supply Fan Lockout to occur.
- A Supply Fan Lockout also occurs when the APS opens for more than 2 seconds after fan status is proven to be running.

As per ASHRAE 90.1-2010, the rooftop units have a supply fan VFD installed to control the speed of the supply fan based on cooling/heating demands or standby operation when configured for SZVAV.

SZVAV minimum speed

- User adjustable setpoint that can be found under SETPOINTS-SUPPLY SYSTEM menu.
- This is the speed the supply fan operates at per Table 22.

Continuous ventilation

- User adjustable program that allows the supply fan to run continuously when in Occ mode.
- It can be found under PROGRAM-VENTILATION menu.
- When continuous ventilation is User Enabled, the supply fan is ON whenever the unit is in an Occ mode.
- When continuous ventilation is User Disabled, the supply fan is started with a demand for cooling or heating. The APS must be closed before cooling or heating operation is permitted.

Supply fan modulation

- When the rooftop unit is in Occ Standby (continuous ventilation is User Enabled) or Occ/Unocc Cooling Low, the supply fan is running at the SZVAV minimum speed.
- If the current zone temperature rises 1.5°F (-16.9°C) above the active zone temperature setpoint, the IPU board starts to increase the supply fan speed.
- The supply fan speed keeps increasing as the zone temperature rises higher above the active zone temperature setpoint.
- When the zone temperature is above the active zone temperature setpoint by 2.5°F (-16.4°C), the supply fan is at full speed (100%).

Cooling and heating operation

- On a SZVAV unit, cooling and heating demands is determined in one of two ways:
    a. Zone temperature
        i. Wired zone temperature
        ii. Communicated zone temperature
    b. Staged input
        i. Thermostat (two-stage cooling/heating)
        ii. BAS commands
- The zone control method must be selected under the PROGRAM-UNIT DATA menu:
    a. Wired Zone Temperature: Hardwired sensor to CTB1, 10K Type III thermistor
    b. Comm Zone Temperature: Zone temperature signal from a BAS (BACnet MS/TP point AV40 ZONE_TEMP_BAS)
    c. Staged: Either a thermostat is connected to the appropriate terminals on CTB1 or BAS commands are used for Y1, Y2, W1, W2, and G terminals
- The occ/unocc cooling setpoints can be viewed under the SETPOINTS-COOLING menu.
- The OCC/UNOCC HEATING SPs can be viewed under the SETPOINTS-HEATING menu.
- These setpoints are also available on a BAS.
- Table 23 shows the relationship between zone temperature and unit modes.

SZVAV supply air temperature (SAT)

- Once a SZVAV configured unit enters an Active Cooling or Heating mode, the IPU board utilizes as many stages of cooling or heating as needed to achieve and maintain the ACTIVE SAT setpoint.
- This includes economizer operation if outside air conditions are suitable.
- 1ST AND 2ND STAGE COOLING SPs can be found under the SETPOINTS-COOLING menu.
- 1ST AND 2ND STAGE HEATING SPs can be found under the SETPOINTS-HEATING menu.
- These SPs are also available on a BAS.
- Table 23 shows the active SAT setpoints for each unit mode in SZVAV.

Table 23: SZVAV — current unit modes

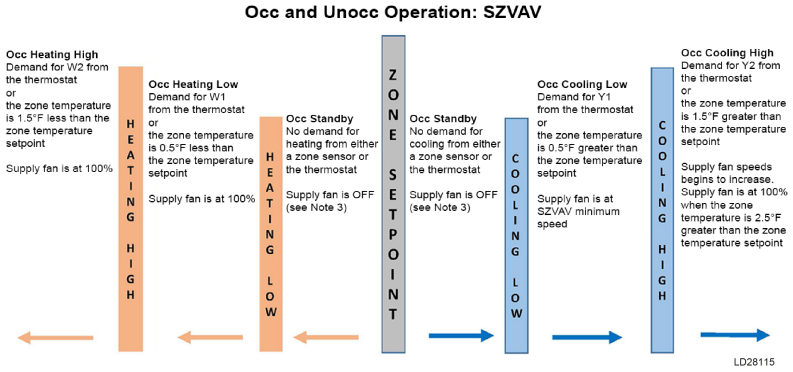
Unit mode	Zone temperature
Occ Standby	There is no demand for cooling or heating
	Supply fan at SZVAV minimum speed if there is a demand for G terminal either from a thermostat or from the BAS
	Supply fan at SZVAV minimum speed if continuous ventilation is User Enabled
	Supply fan OFF if continuous ventilation is User Disabled
Occ Cooling Low	Current zone temperature is 0.5°F above the occ/unocc zone cooling setpoint
	There is a demand for Y1 terminal either from a thermostat or from the BAS
	Supply Fan at SZVAV minimum speed
Occ Cooling High	Current zone temperature is 1.5°F above the occ/unocc zone cooling setpoint
	There is a demand for Y2 terminal either from a thermostat or from the BAS
	At this point the supply fan speed starts to increase as the cooling demand increases, and decrease as the cooling demand decreases.*
	The supply fan is at 100% when the current zone temperature is above the occ/unocc zone cooling setpoint by 2.5°F
Occ Heating Low	Current zone temperature is 0.5°F below the occ/unocc zone heating setpoint
	There is a demand for W1 terminal either from a thermostat or from the BAS
	Supply fan at 100%
Occ Heating High	Current zone temperature is 1.5°F below the occ/unocc zone heating setpoint
	There is a demand for W2 terminal either from a thermostat or from the BAS
	Supply fan at 100%
Unocc Standby	There is no demand for cooling or heating and the supply fan is OFF
Comfort Ventilation Cooling	See description in Comfort ventilation
Comfort Ventilation Heating	See description in Comfort ventilation
Morning Warm-Up	See description in Heating
Unocc Cooling Low	Current zone temperature is 0.5°F over the unocc zone cooling setpoint
	There is a demand for Y1 terminal either from a thermostat or from the BAS
	Supply fan at SZVAV minimum speed
Unocc Cooling High	Current zone temperature is 1.5°F over the unocc zone cooling setpoint
	There is a demand for Y2 terminal either from a thermostat or from the BAS
	At this point the supply fan speed starts to increase as the cooling demand increases, and decrease as the cooling demand decreases*
	The supply fan is at 100% when the current zone temperature is above the unocc zone cooling setpoint by 2.5°F
Unocc Heating Low	Current zone temperature is 0.5°F under the unocc zone heating setpoint
	There is a demand for W1 terminal either from a thermostat or from the BAS
	Supply fan at 100%
Unocc Heating High	Current zone temperature is 1.5°F under the unocc zone heating setpoint
	There is a demand for W2 terminal either from a thermostat or from the BAS
	Supply fan at 100%

Note: * When a SZVAV unit is being controlled by a staged input, a demand for Y2 terminal causes the supply fan to go directly to 100% from SZVAV minimum speed. There is no modulation as with zone temperature.

Table 24: SZVAV — supply air temperature (SAT) setpoints

Unit mode	Setpoints
Occ Standby	There is no demand for cooling or heating
Occ Cooling Low	Active SAT cooling setpoint is the 1st stage cooling setpoint
Occ Cooling High	Active SAT cooling setpoint is the 2nd stage cooling setpoint
Occ Heating Low	Active SAT heating setpoint is the 1st stage heating setpoint
Occ Heating High	Active SAT heating setpoint is the 2nd stage heating setpoint
Unocc Standby	There is no demand for cooling or heating, and supply fan is OFF
Unocc Cooling Low	Active SAT setpoint is the 1st stage cooling setpoint
Unocc Cooling High	Active SAT setpoint is the 2nd stage cooling setpoint
Unocc Heating Low	Active SAT setpoint is the 1st stage heating setpoint
Unocc Heating High	Active SAT setpoint is the 2nd stage heating setpoint

Figure 27: Single zone VAV (SZVAV) and constant volume (CV) — occupied and unoccupied



Note:

1. Whenever the unit enters an active cooling or active heating mode, the IPU board utilizes as many or as few stages of cooling or heating that it needs to achieve and maintain the active supply air temperature setpoint.
2. The unocc sequence is the same as above except that the zone temperature setpoints used are the unocc sotpoints' values.
3. The supply fan is staged on or off with a cooling or heating demand unless continuous ventilation is user enabled or there is a call for the G terminal.

Variable air volume (VAV)

- An HVAC system that has VAV boxes installed in the ductwork operates as VAV. Typical VAV systems have overhead ductwork that provides conditioned air down into the space.
- A VAV unit has a supply fan controlled by a VFD that is capable of running at different speeds to maintain a constant duct static pressure.

- The VFD speed is controlled by a duct static pressure transducer that also provides high duct static pressure protection.

VAV setup

- Unit type must be set to VAV in the OPTIONS-UNIT DATA menu.
- Duct static low and high setpoints must be set in the SETPOINTS-SUPPLY SYSTEM menu.
- Unit design airflow must be set in the SETPOINTS-UNIT DATA menu.
- Return air temperature (RAT) cooling setpoint must be set in the SETPOINTS-COOLING menu.
- SAT low and high setpoints must be set in the SETPOINTS-COOLING menu.
- Unocc zone cooling setpoint must be set in the SETPOINTS-COOLING menu if utilizing night set-back.
- RAT heating setpoint must be set in the SETPOINTS-HEATING menu (if applicable).
- Heating SAT setpoints must be set in the SETPOINTS-HEATING menu (if applicable).
- Unocc zone heating setpoint must be set in the SETPOINTS-HEATING menu if utilizing night set-back.
- The IPU board must have a valid zone temperature reading if utilizing night set-back:
    - Hardwired zone sensor to CTB1
    - Communicated zone temperature from the BAS

Supply fan

- The supply fan must be running before any other unit operation is allowed.
- The IPU board monitors the status of an APS to determine the supply fan status.
- When a VAV configured unit is in the Occ mode, the supply fan is ON.
- The supply fan is cycled ON/OFF with a cooling/heating demand on a VAV configured unit when in the Unocc mode.
- The IPU board provides a start/stop signal to the supply fan VFD.
- The IPU board outputs a 0 to 10 VDC signal to the supply fan VFD to control the speed.
- The supply fan speed is controlled to achieve and maintain the active duct static pressure setpoint.

Supply fan status

- The rooftop units use an APS to determine supply fan status.
- The APS is a diaphragm type switch that closes at approximately 0.30 iwg.
- The APS is mounted above the supply fan blower assembly.
- The APS senses the static pressure through a factory installed tube that passes through the supply fan wall into the next section of the unit.
- The APS needs to close and prove supply fan status within 45 seconds after the supply fan is commanded on.
- Failure to prove supply fan status within 45 seconds causes a Supply Fan Lockout to occur.
- A Supply Fan Lockout also occurs if the APS opens for more than 2 seconds once fan status is proven to be RUNNING.

Table 25: VAV supply fan speed

Unit mode	Status
Occ Standby	Supply fan VFD controlled to maintain active duct static setpoint
Occ Cooling	Supply fan VFD controlled to maintain active duct static setpoint
Occ Heating	Supply fan VFD controlled to maintain active duct static setpoint
Unocc Standby	Supply fan is OFF
Unocc Cooling	Supply fan VFD controlled to maintain active duct static setpoint
Unocc Heating	Supply fan VFD controlled to maintain active duct static setpoint
Morning Warm-Up	Supply fan VFD controlled to maintain active duct static setpoint

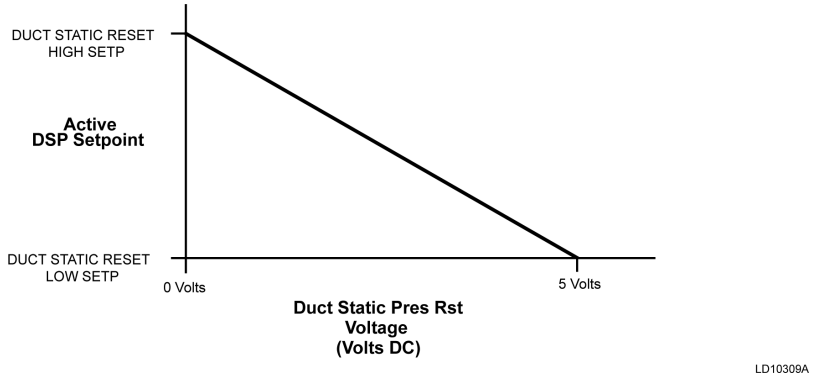
Supply fan control

- A rooftop unit configured for VAV has a supply fan VFD and a duct static pressure transducer installed at the factory.
- The duct static pressure transducer sends a 0–5 VDC signal to the IPU board according to the static pressure it is sensing.
- The IPU board reads the 0–5 VDC input and then sends a 0–10 VDC signal out to the VFD to control the speed to the active duct static pressure setpoint.

Duct static reset

- A rooftop unit configured for VAV has the ability to reset the active duct static pressure setpoint.
- Duct static reset can be initiated in one of two ways:
    - Hardwired: 0 to 5 VDC signal connected to CTB1, terminals 25, 26, and 27
    - BAS: A 0 to 5 command sent to the unit via the BAS, BACnet MS/TP point AV05. Duct pressure reset BAS must be User Enabled. Duct pressure reset BAS can be found in the SERVICE menu.

Figure 28: Active duct static pressure setpoint vs. duct static pressure reset voltage



- When duct static reset is User Disabled, the active duct static pressure setpoint is always the duct static reset high setpoint.
- When duct static reset is User Enabled, the active duct static pressure setpoint is either the duct static reset high setpoint, duct static reset low setpoint, or somewhere in between depending on the reset signal provided to the IPU board.
- The duct static reset high and duct static reset low setpoints can be found under the SETPOINTS-SUPPLY SYSTEM menu.

- These setpoints are also available on a BAS.

Duct static reset high setpoint

- This is the active duct static pressure setpoint that the IPU board tries to maintain when duct static reset is User Disabled.
- This is the high end of the static pressure range when duct static reset is User Enabled.

Duct static reset low setpoint

- This is the low end of the duct static pressure range when duct static reset is User Enabled.

Duct static over pressure

- This is the duct static pressure that causes the unit to immediately shut down on a Duct High Pressure Alarm.

Supply fan sync

- Supply fan sync is only applicable for rooftop units configured as VAV.
- The rooftop unit has the ability to synchronize the operation of the supply fans when units of the same tonnage are installed in a master or satellite arrangement, also known as twinning.
- Supply fan sync allows the BAS to input the same VDC signal to two or more units. This ensures the supply fans are running at the same speed.
- The factory strongly recommends installing field provided isolation dampers and manual reset duct static pressure safety switches when operating in this type of arrangement.
- To utilize this sequence, supply fan sync must be User Enabled and the unit type must be VAV.
- Find supply fan sync under the PROGRAM-SUPPLY SYSTEM menu.
- To utilize this sequence, a 1 to 5 VDC signal must be provided to CTB1, terminals 25, 26, and 27:

    a. Terminal 25: +5 VDC (duct static pressure setpoint +5 VDC)
    b. Terminal 26: duct static pressure + (duct static reset +)
    c. Terminal 27: duct static pressure - (duct static reset -)

- The IPU board requires approximately 1 VDC to start the supply fan. Once the fan is started, Table 26 shows the expected speeds and speed percentage at different VDC signals.
- When the VDC signal drops to approximately 0.5 VDC, the supply fan shuts down on auto reset. After voltage increases above 1 VDC, the supply fan restarts.

Table 26: Supply fan sync control

VDC signal	Supply fan speed (Hz)
1 VDC	20% at approximately 32
2 VDC	40% at approximately 40
3 VDC	60% at approximately 46
4 VDC	80% at approximately 53
5 VDC	100% at approximately 60

Note: YORK recommends installing the tubing from the duct static pressure transducer to the proper location in the unit ductwork. The duct static pressure transducer provides the only factory installed duct over pressure device.

Cooling and heating operation

- On a VAV configured unit, cooling and heating demands in Occ mode are determined by the current RAT.
- The IPU board compares the current RAT against the RAT cooling setpoint and the RAT heating setpoint to determine when to enter an Active Cooling or Heating mode.
- If the current RAT remains between the RAT cooling setpoint and the RAT heating setpoint, the unit remains in Occ Standby.
- RAT cooling setpoint can be found under the SETPOINTS-COOLING menu.
- RAT heating setpoint can be found under the SETPOINTS-HEATING menu.
- In Unocc mode, cooling and heating demands is determined by the current zone temperature.
- Unocc cooling and heating are only allowed if night set-back is User Enabled. unocc cooling zone setpoint can be found under the SETPOINTS-COOLING menu.
- Unocc heating zone setpoint can be found under the SETPOINTS-HEATING menu.
- If the IPU board does not see a valid zone temperature and night set-back is User Enabled, this creates a fault and causes a unit lockout.
- Night set-back can be found under the PROGRAM-UNIT DATA menu.
- All setpoints are also available on a BAS.

Table 27: VAV UNIT MODE

Unit mode	Zone temperature
Occ Standby	No demand for cooling or heating exists
Occ Cooling	Current RAT is above the active cooling RAT setpoint by 0.5°F
Occ Heating	Current RAT is below the active heating RAT setpoint by 0.5°F
Unocc Standby	No demand for cooling or heating exists
Unocc Cooling	Current zone temperature is above the unocc cooling zone setpoint by 0.5°F
Unocc Heating	Current zone temperature is below the unocc heating zone setpoint by 0.5°F

Active supply air temperature (SAT) setpoint

- Once a VAV configured unit enters an Active Cooling or Heating mode, the IPU board turns ON/OFF stages of cooling or heating as needed to achieve and maintain the active SAT setpoint.
- This includes economizer operation if outside air conditions are suitable.

Cooling mode

- In the Cooling mode, the active cooling SAT setpoint can either be a fixed value or can be reset be reset using the SAT reset method control logic built into the IPU board.

Heating mode

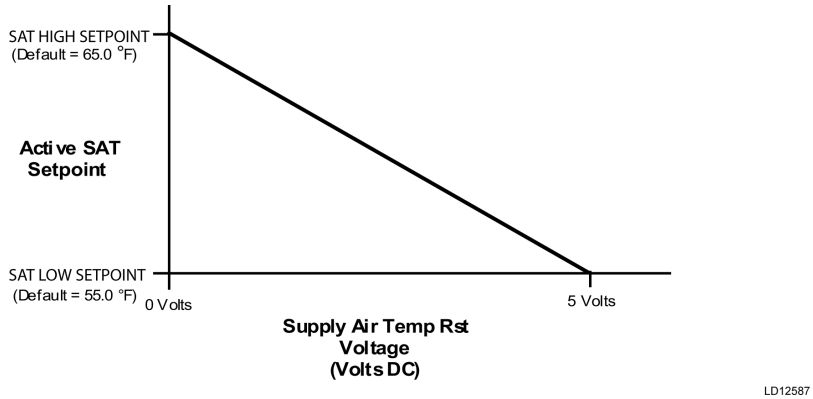
- In the Heating mode, the active heating SAT setpoint is a fixed value and does not have the ability to be reset like the active cooling SAT setpoint.

SAT reset method

- A rooftop unit configured for VAV operation has the ability to reset the active cooling SAT setpoint by using one of four methods. The SAT reset method can be selected under the OPTIONS-UNIT DATA menu.

- Three of the reset methods (RAT, OAT, and supply fan VFD speed) use internal programming and logic, return air, outside air, and supply fan speed.
- The fourth method (hardwired) uses a VDC signal sent from a field installed controller or a command from a BAS.
- These four methods, including how they work and the user adjustable setpoints available, are describe as follows.

Figure 29: Active SAT setpoint versus SAT reset voltage



1. Hardwired

    - This method uses built in logic that resets the active SAT setpoint based on either a 0 to 5 VDC signal to CTB1 or a 0 to 5 command from the BAS.
    - To use the 0 to 5 command from the BAS, SAT reset BAS must be User Enabled. SAT reset BAS can be found under the SERVICE menu.
    - A VDC signal or BAS command of 0 causes the active cooling SAT setpoint to be the SAT high setpoint.
    - A VDC signal or BAS command of 5 causes the active cooling SAT setpoint to be the SAT low setpoint.
    - A VDC signal or BAS command between 0 to 5 causes the active cooling SAT setpoint to be between the SAT high and SAT low setpoints per Figure 29.
    - When a fixed SAT setpoint is required, choose this SAT reset sequence, and then set the SAT high setpoint to the required value.

2. Return air temperature (RAT)

    - This method uses built in logic that resets the active SAT setpoint based on the current RAT.
    - There is no VDC signal or BAS command required to perform this sequence.
    - The IPU board monitors the current RAT and reset the active SAT setpoint as needed.
    - A current RAT that is equal to/below the RAT setpoint for high SAT causes the active cooling SAT setpoint to be the SAT high setpoint.
    - A current RAT that is equal to or above the RAT setpoint for low SAT causes the active cooling SAT setpoint to be the SAT low setpoint.
    - A current RAT that is between the RAT setpoint for high SAT and the RAT setpoint for low SAT causes the active cooling SAT setpoint to be between the high SAT and low SAT setpoints. See Figure 30.

3. Outside air temperature (OAT)

    - This method uses built in logic that resets the active SAT setpoint based on the current OAT.
    - There is no VDC signal or BAS command required to perform this sequence.
    - The IPU board monitors the current OAT and resets the active SAT setpoint as needed.
    - A current OAT that is equal to/below the OAT setpoint for high SAT causes the active cooling SAT setpoint to be the SAT high setpoint.
    - A current OAT that is equal to/above the OAT setpoint for low SAT causes the active cooling SAT setpoint to be the SAT low setpoint.
    - A current OAT that is between the OAT setpoint for high SAT and the OAT setpoint for low SAT causes the active cooling SAT setpoint to be between the high SAT and low SAT setpoints. See Figure 31.

4. Supply fan VFD speed

    - This method uses built in logic that resets the active SAT setpoint based on the current supply fan VFD speed.
    - There is no VDC signal or BAS command required to perform this sequence.
    - The IPU board monitors the current supply fan speed and resets the active SAT setpoint as needed.
    - A current supply fan speed that is equal to or below the fan speed for high SAT causes the active cooling SAT setpoint to be the SAT high setpoint.
    - A current supply fan speed that is equal to/above the fan speed for low SAT causes the active cooling SAT setpoint to be the SAT low setpoint.
    - A current supply fan speed that is between the fan speed for high SAT and the fan speed for low SAT causes the active cooling SAT setpoint to be between the high SAT and low SAT setpoints. See Figure 32.

SAT reset method setpoint

- All setpoints for SAT reset method listed in the above sequences can be found under the SETPOINTS-COOLING menu.
- The reset method setpoints for RAT, OAT, or supply fan VFD speed are only shown if that SAT reset method is the one selected.
- The heating SAT setpoint can be found under the SETPOINTS-HEATING menu.
- These setpoints are also available on a BAS.

Figure 30: Active SAT setpoint versus RAT

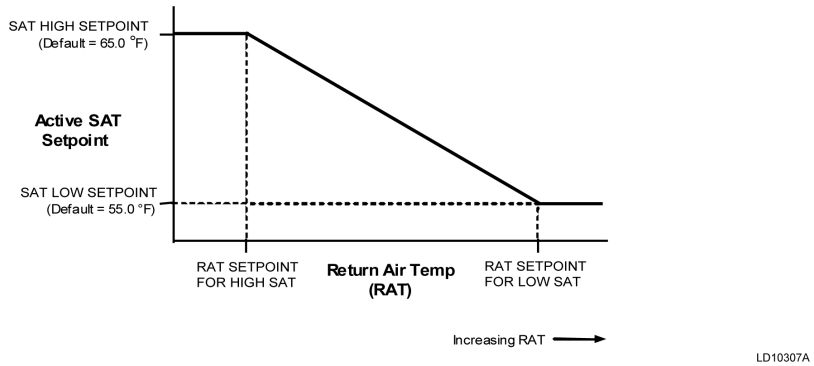


Figure 31: Active SAT setpoint versus OAT

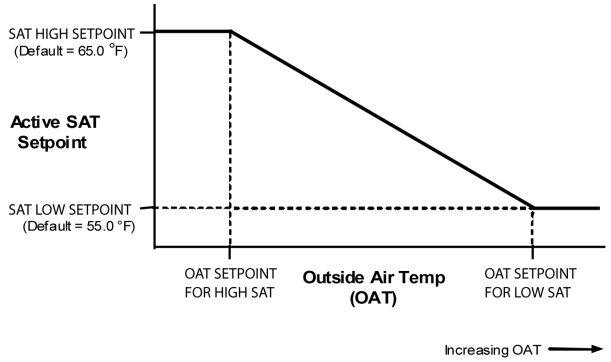


Figure 32: Active SAT setpoint versus supply fan speed

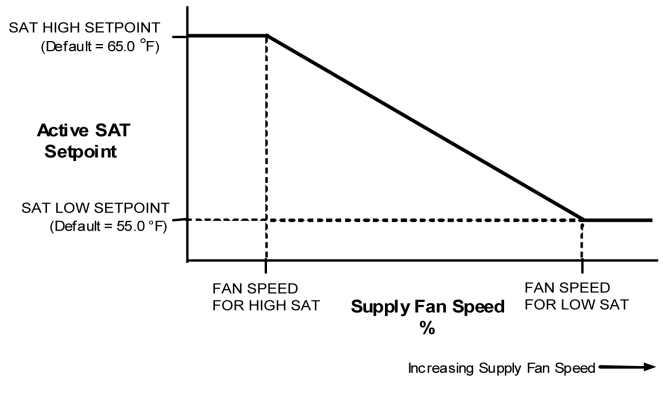
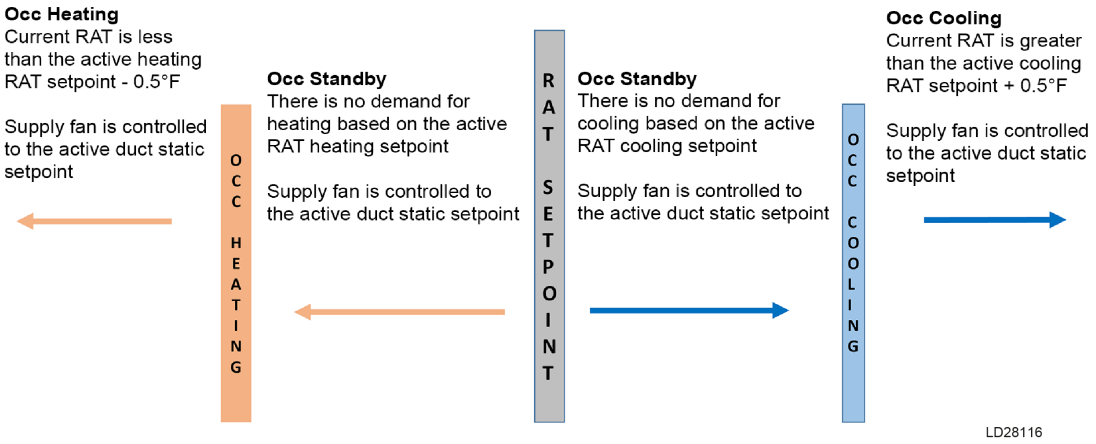


Figure 33: Variable air volume (VAV) — occupied

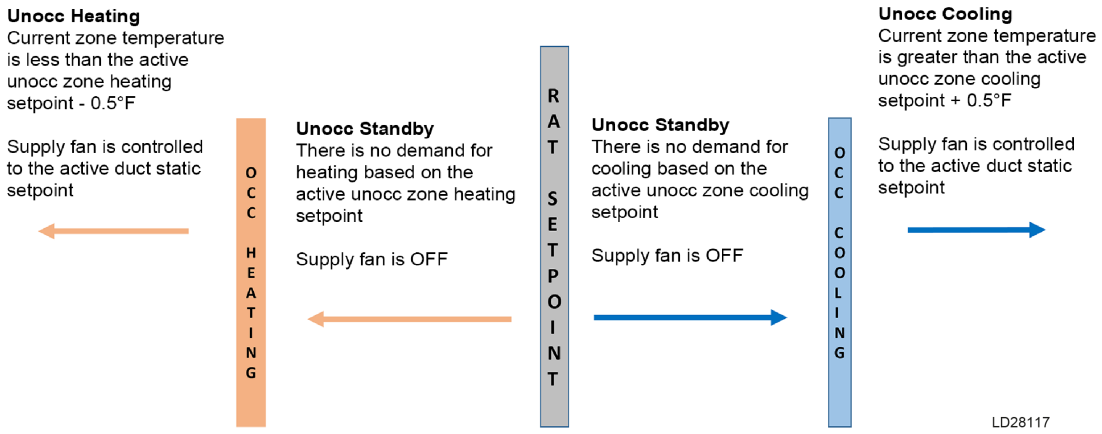


Note:

1. Whenever the unit enters an active cooling or heating mode, the IPU board utilizes as many or as few stages of cooling or heating that it needs to achieve and maintain the active supply air temperature setpoint.
2. Unit modes stage down when the zone temperature is 0.5°F under the setpoints for cooling and 0.5°F over the setpoints for heating.

3. The supply fan runs continuously in the VAV Occ mode.

Figure 34: VAV — unoccupied



Note:

1. Whenever the unit enters an active cooling or heating mode, the IPU board utilizes as many or as few stages of cooling or heating that it needs to achieve and maintain the active supply air temperature setpoint.
2. Unit modes stage down when the zone temperature is 0.5°F under the setpoints for cooling and 0.5°F over the setpoints for heating.
3. In the Unocc mode, the supply fan is staged on or off with a cooling or heating demand.
4. Night setback must be user enabled for Unocc operation.

Compressors: control and operation

Compressor systems

- The rooftop units have three completely independent compressor systems. Each compressor system has two compressors piped in a tandem arrangement.
- Each system has a low pressure cutout (LPCO) switch, a compressor safety chain, liquid line filter driers, and two thermostatic expansion valves (TXVs) (one each for the upper and lower evaporator coils).
- Each compressor in a tandem arrangement can be staged on independently of the other compressor. This staging allows better control of the SAT and keeps undercooling and overcooling to a minimum under normal operating conditions.

Compressor control

- The IPU board has internal logic and programming to stage compressors on or off to achieve and maintain the active cooling SAT setpoint.
- Under normal operation, each compressor has a 3.5 minute guaranteed on and off timer.
- Under normal operating conditions, there is a 3.5 minute interstage time delay after any compressor is started, stopped before starting, or when stopping another compressor unless fast compressor start is user enabled.

Compressor staging

- The rooftop units have three sets of tandem scroll compressors. This allows the unit to have six stages of cooling.
- When the unit enters an Active Cooling mode, the IPU board starts to stage compressors ON.
- The IPU board stages compressors on or off to achieve and maintain the active SAT setpoint.
- If a compressor system has experienced a Safety Lockout, that circuit is removed from the compressor staging circuit until the Safety Lockout clears.
- Compressor staging is also affected when only one or two of the three systems have a low ambient package.
- See Table 28 for compressor staging.

Table 28: Compressor staging

Stages	Staging on
0 to 1	When both compressors 1A and 1B are ready to run, the IPU board turns ON the compressor with the fewest starts
1 to 2	When compressors 2A, 2B, 3A, and 3B are ready to run, the IPU board turns ON the compressor with the fewest starts
2 to 3	The IPU board turns ON either the A or B compressor with the fewest starts from the remaining circuit that is not yet active
3 to 4	The IPU board turns ON the inactive compressor from the circuit started in the stage 0 to 1 step
4 to 5	The IPU board turns ON the inactive compressor from the circuit started in the stage 1 to 2 step
5 to 6	The IPU board turns ON the inactive compressor from the circuit started in the stage 2 to 3 step

Stages	Staging off
6 to 5	When compressors 3A, 3B, 2A, and 2B are all ready to stop, the IPU board turns OFF the compressor with the fewest starts
5 to 4	Whichever circuit 2 or 3 still has two compressors operating, the IPU board turns OFF the compressor with the fewest starts
4 to 3	Turn OFF compressor 1A or 1B, whichever has the fewest starts
3 to 2	Turn OFF a compressor from either circuit 2 or 3 that has the fewest starts
2 to 1	Turn OFF the last active compressor from either circuit 2 or 3
1 to 0	Turn OFF the active compressor from circuit 1

Fast compressor start

- The rooftop unit's patented Fast Compressor Start sequence stages on compressors quickly when switching from a Standby mode to a Cooling mode.
- Fast compressor start can be user enabled or disabled. It can be found under the PROGRAM-UNIT DATA menu.

Fast compressor start is user enabled

1. When the IPU board switches from a Standby mode to a Cooling mode, it uses internal programming logic to determine the correct stage of cooling that is needed.
2. When the correct stage is determined, the IPU board stages on compressors, with a 15 second time delay in between, until the appropriate numbers of compressors are operating.
3. When the appropriate stage is reached, normal compressor staging applies, with a 3.5 minute time delay between compressor starts and stops.
4. One of the variables used in fast compressor start is the unit design airflow. This value needs to be entered correctly for fast compressor start to work properly. Unit design airflow can be found in the SETPOINTS-UNIT DATA menu.

Fast compressor start is user disabled

- When the IPU board switches from a Standby mode to a Cooling mode, it stages ON compressors one at a time with the normal 3.5 minute time delay between staging on a new compressor.

Compressor operation

- The rooftop units utilize scroll compressor technology.
- The IPU board constantly monitors the compressor safety circuit, LPCO switch, and suction line temperature of a compressor circuit.
- The mechanical cooling lockout setpoint is 50.0°F. No compressor operation is allowed below this temperature unless a low ambient package was ordered. Low ambient packages can be ordered for one, two, or three systems.
- Each compressor circuit has a tandem set of compressors piped together to a common suction and discharge line. There is an oil equalization line between the two compressors.

Table 29: Compressor model (HP/tonnage)

		70 ton	75 ton	80 ton	90 ton	105 ton
Compressor system	1A	ZP137 (12)	ZP154 (13)	ZP154 (13)	ZP182 (15)	ZP235 (20)
	1B	ZP137 (12)	ZP154 (13)	ZP154 (13)	ZP182 (15)	ZP235 (20)
	2A	ZP120 (10)	ZP137 (12)	ZP154 (13)	ZP182 (15)	ZP182 (15)
	2B	ZP120 (10)	ZP137 (12)	ZP154 (13)	ZP182 (15)	ZP182 (15)
	3A	ZP120 (10)	ZP137 (12)	ZP137 (12)	ZP154 (13)	ZP235 (20)
	3B	ZP120 (10)	ZP137 (12)	ZP137 (12)	ZP154 (13)	ZP235 (20)

Table 30: Compressor status menu

Status	Message
NORMAL – BOTH OFF	These compressor status messages show the compressor system status is normal, there are no faults, and the ON/OFF operating status of each compressor
NORMAL – #A ON, #B OFF	
NORMAL – #A OFF, #B ON	
NORMAL – BOTH ON	
SAFETY TRIP	AUTO RESET LPCO TRIP 1
	AUTO RESET LPCO TRIP 2
	AUTO RESET COMP SAFETY CHAIN TRIP 1
	AUTO RESET COMP SAFETY CHAIN TRIP 2
SAFETY LOCKOUT	LOCKOUT-COMP SYS #
	LOCKOUT-COMP SYS # TIME-OUT
	LOCKOUT-COMP SYS LPCO #
	LOCKOUT-OAT SENSOR
SAFETY FAULT	AUTO RESET-LOW SUCT TEMP #
LOW-AMB INHIBIT	Mechanical cooling is not permitted due to OAT lower than the mechanical cooling lockout temperature
HIGH DP UNLOAD #	A compressor circuit shuts down one of the compressors due to high discharge pressure

- The IPU board starts or stops compressors accordingly to achieve and maintain the active cooling SAT setpoint when all of following are true:
    - The unit is in Active Cooling mode.
    - OAT is above the mechanical cooling lockout temperature (50.0°F).
    - Low ambient package not installed.
- See Table 29 for details on the compressor HP/tonnage for each compressor system.

Compressor status

- The IPU board provides different messages for the status of a compressor system.
- These status messages can be helpful in troubleshooting the unit.
- The messages can be seen under the Status menu or the Comp Sys # menu.
- Table 30 shows the different messages that can be displayed.

Compressor safety circuits

- Each compressor system contains the following safeties:

    a. Compressor safety chain
    b. LPCO
    c. Suction line temperature sensor

- These safeties is constantly monitored whenever a compressor system is in operation.
- These safeties cause the shutdown and possible lockout of a compressor system if any abnormal conditions exist.
- The first two faults of the compressor safety chain or LPCO is an Auto-Reset Fault. The third trip in a 120 minute time period results in a Safety Lockout, which requires a manual reset.
- Once a safety chain or LPCO trip occurs, the IPU board starts a 60 minute timer where the fault needs to clear. If the fault does not clear within 60 minutes, a Lockout-Comp System Timeout displays.
- A compressor system can also have a high pressure unloading sequence if discharge pressure transducers are installed on a compressor circuit.

Compressor safety chain

- The compressor safety circuit consists of:

    a. High pressure cutout (HPCO) switch: one per circuit
    b. Manual motor starter/overload relay: one per compressor
    c. Compressor protection module: one per compressor

- Certain compressors, depending on the HP, do not contain a compressor protection module. They only contain an internal thermal overload in the motor windings
- The internal overload is not connected to the compressor safety chain
- When the internal overload opens, a fault is not registered and the IPU board still tries to run that compressor when a cooling demand exists
- The safety switches that make up the compressor safety circuit are wired in series

Compressor safety circuit sequence of operation

- The IPU board monitors the status of each compressor safety circuit.
- When any of the safety switches open, compressor operation terminates immediately, and a compressor safety trip occurs.
- Wiring of the compressor safety chain is shown in Figure 35 below and Figure 36 and Figure 37 (Comp Sys #1 shown). Refer to the unit's wiring diagrams for other systems.

- At this time, the IPU board starts a 60 minute timer. If the compressor safety circuit status remains faulted/open for 60 minutes, a compressor safety lockout occurs.
- When the faulted/open safety switch resets within the 60 minute timer, normal operation continues.
- Once a safety faults/opens, the IPU board also starts a separate 120 minute timer. When three safety trips occur within that 120 minute window, a Compressor Safety Lockout occurs.
- When the 120 minute timer expires and three safety trips have not occurred, the timer resets.
- Approximate safety switch reset times are as follows:
- HPCO switch: Approximately 30 seconds to 5 minutes to reset.
- Compressor protection module: Approximately 30 minutes to reset.
- Manual motor starter/overload relay: This requires a manual reset of the overload relay as well as the compressor circuit.
- A Compressor Safety Lockout requires a manual reset through the IPU board.

Figure 35: Compressor safety chain — without compressor protection module

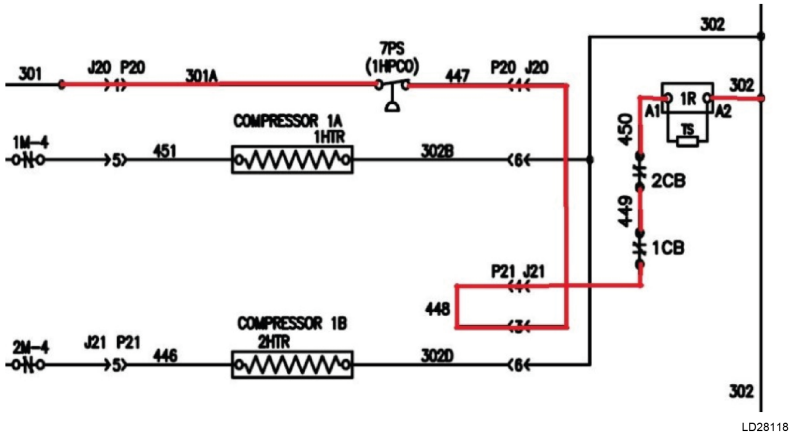


Figure 36: Compressor safety chain — with compressor protection module

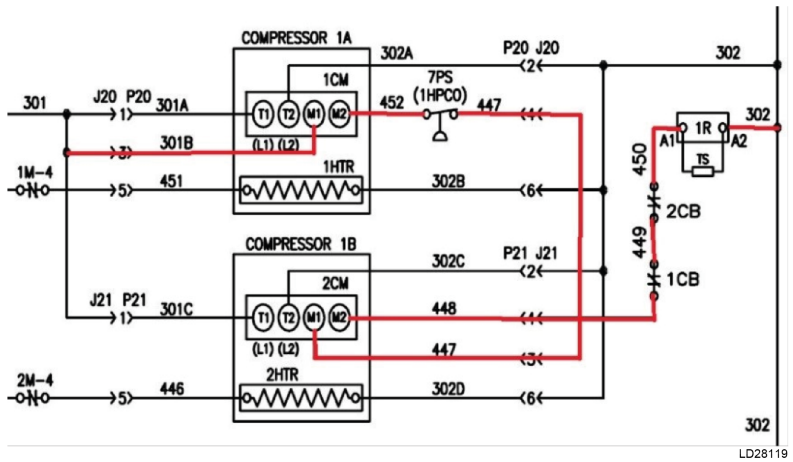


Figure 37: Compressor system status input to I/O board

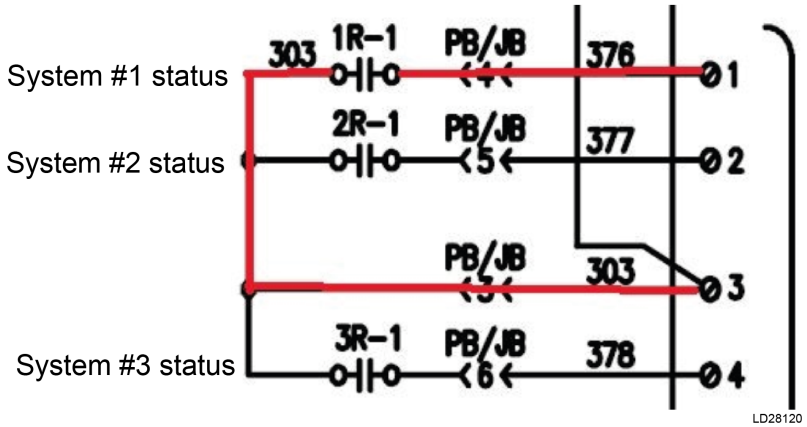
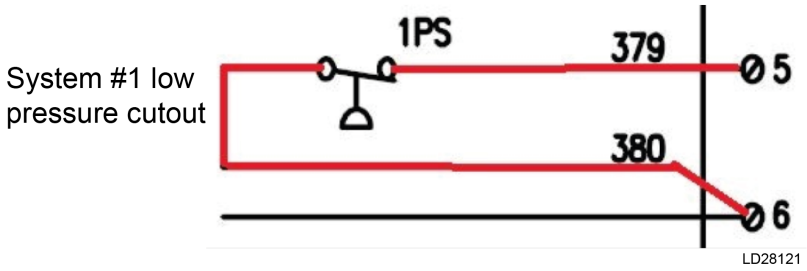


Figure 38: Low pressure cutout (LPCO) switch wiring



Low pressure cutout (LPCO) switch

- Each compressor system contains a LPCO.
- The IPU board monitors the status of the LPCO whenever a compressor system is in operation.
- The LPCO status is ignored for the first 45 seconds after a compressor system is started to allow the suction pressure to build up to a stabilized condition.
- Wiring of the LPCO is shown in Figure 38 (Comp Sys #1 shown). Refer to the unit's wiring diagrams for other systems.
- If the LPCO faults or opens while a compressor system is in operation, compressor operation terminates immediately, and a compressor LPCO trip occurs. Once the LPCO switch closes, normal compressor operation continues.
- At this time, the IPU board starts a 120 minute timer. When two or more LPCO trips occur within this 120 minutes, a Compressor LPCO Safety Lockout occurs.
- A Compressor LPCO Safety Lockout requires a manual reset through the IPU board.

Resetting a compressor system safety lockout

- Once a compressor system experiences either a Compressor Safety Lockout or a Compressor LPCO Safety Lockout, a manual reset is required
- Resetting a Safety Lockout is achieved by performing the following steps:

    a. Leave the control/rocker switch in the ON position.
    b. Press the COMPRESSOR SYSTEMS key.

c. Use the left/right arrows to navigate to the compressor system with the lockout.
d. Use the up/down arrows to find the screen that displays Compressor Sys # State Lockout.

   ⓘ **Note:** The # symbol is replaced by the compressor system number, 1, 2, or 3 in the actual display on the unit.

e. Press the PROGRAM key and use the left/right arrows, navigate until the top line of display shows Program - Compressor System #.

   ⓘ **Note:** On older versions of software, resetting the Comp Sys # Safety Lockout was done in the Options menu. If the reset is not found in the Program menu, try finding it in the Options menu.

f. Press the ? key and enter the password when prompted (9725) and then press the ? key again.
g. The display should now show:
   Program-Compressor System #: Check to Edit
   Compressor Sys # State: Lockout
h. Press the ? key and use the left/right arrows to change from Lockout to Run, and press the ? key again.

   i. When the compressor state returns to Lockout, that means a safety switch is still open and further troubleshooting is required.
   ii. When the compressor state remains in Run, press the X key and exit out of the PROGRAM-COMPRESSOR SYSTEM # menu.

i. The Compressor System Lockout has now been cleared and reset.

Suction temperature monitoring

- On the rooftop unit, each compressor system contains a suction line temperature sensor.
- This sensor monitors the temperature of the suction line while a compressor system is operating.
- When one compressor in a system is running and the suction line temperature falls below the low suction temperature limit (37.0°F for R-410A) for 10 seconds, the compressor shuts OFF. The second compressor in the system is allowed to start when the suction line temperature rises above the low suction temperature limit.
- The compressor remains off until the suction line temperature rises above the suction temperature low limit by 10.0°F for 10 minutes.
- When both compressors are operating at the time of the trip, the one with the longest run time shuts OFF.
- After 1 minute, the IPU board looks again at the suction line temperature. When the temperature is still below the suction temperature low limit, the compressor still operating shuts down.
- Both compressors remain OFF until the suction line temperature rises over the suction temperature low limit by 10.0°F for 10 minutes.

High discharge pressure unloading

- This sequence helps prevent compressor safety trips and lockouts on a compressor system due to higher than normal ambient temps or dirty condenser coils.

- For this sequence to operate both of the below conditions must be met:
    a. A discharge pressure transducer must be installed and reading properly for a compressor system.
    b. Both compressors in a compressor system must be operating.
- The IPU board monitors the discharge pressure in a given compressor system.
- When the discharge pressure reaches the system unloading pressure, one of the compressors is shut down. Compressor status displays High DP Unload.
- The system unloading pressure can be found under the SETPOINTS-COMPRESSOR SYSTEM menu.
- When High DP Unload is displayed, the IPU board records the current OAT.
- Once the current OAT is 5.0°F (-15.0°C) less than the OAT at the time High DP Unload started, the compressor system is returned to normal operation.

Low ambient inhibit

- The IPU board displays this compressor status message when the current OAT is below the mechanical cooling lockout temperature.
- The mechanical cooling lockout temperature is a fixed value of 50.0°F when a compressor system has no low ambient package installed or the discharge pressure transducer reading is out of range.
- The mechanical cooling lockout temperature is user adjustable on a compressor system with a low ambient package installed.
- For compressor systems with a low ambient package installed, mechanical cooling lockout temperature can be found under SETPOINTS-COOLING menu.

Low ambient operation

- Mechanical cooling is not permitted below 50.0°F OAT unless a compressor system has an optional low ambient package installed.
- The low ambient package can be installed on compressor system 1, compressor systems 1 and 2, or all three compressor systems.
- The low ambient package consists of a discharge pressure transducer and condenser fan VFD.
- The condenser fan VFD is controlled directly by the discharge pressure and is not controlled by the IPU board.
- The condenser fan VFD is always installed on the first condenser fan for a compressor system.
- The condenser fan VFD operation is described in further detail in the Low ambient kit.

Hot gas reheat (HGRH)

- The 70 ton to 105 ton rooftop units can have an optional HGRH system.
- HGRH is only available on VAV and SZVAV configured units.
- HGRH is factory installed when the unit is built. There are no field installation kits for HGRH.
- The HGRH system allows a standard DX cooling unit to provide dehumidification of the supply air.

HGRH system

- HGRH is a factory-installed option.
- The HGRH system adds sensible heat to the air being delivered to the space. This allows the DX cooling coil to operate at a lower temperature and remove excess moisture from the air without negatively affecting personal comfort.
- When a HGRH system is installed, the unit has a HGRH coil installed after or downstream of the DX cooling coil.
- The HGRH system uses the discharge gas from compressor circuit 2.
- When HGRH is active, the number of available cooling stages is reduced.
- The HGRH system uses a three-way stepper motor to control the flow of discharge gas between the condenser coil and the HGRH coil.
- The HGRH system has a bleed solenoid valve installed to allow oil drainage back into the compressor.
    - The HGRH bleed solenoid valve is connected between the HGRH coil and the CKT 2 suction line.
    - The HGRH bleed solenoid valve allows remaining or trapped oil or liquid refrigerant to be returned to the CKT 2 refrigerant system when HGRH is inactive.
    - The HGRH bleed solenoid valve is normally closed and energizes (opens) whenever HGRH is inactive.
- HGRH must be set to INSTALLED in the OPTIONS-Unit Data menu for HGRH to function.
- During HGRH/Dehum operation, at least one compressor must be on from either CKT 1 or 3 and one compressor from CKT 2.
- HGRH/Dehum is not permitted if CKT 2 is not able to operate.
- HGRH cannot be installed on unit configure for FlexSys operation.

HGRH three-way stepper valve

- The HGRH system uses a three-way stepper valve to control the refrigerant flow between the condenser coil and the HGRH coil.
- The three-way stepper valve is a Sporlan® MTW-17.
- The valve is controlled by a Sporlan control board IB-G controller.
- The HGRH valve controls the flow of discharge gas between the condenser coil and the HGRH coil depending on the HGRH SAT active SP and the current HGRH SAT.
- The three-way valve has a minimum and maximum position whenever HGRH is active. These values cannot be changed. See Table 31.
    - Outlet A is piped to the condenser coil.
    - Outlet B is piped to the HGRH coil.
    - Outlet C is piped from the CKT 2 discharge line.

Figure 39: HGRH three-way stepper valve

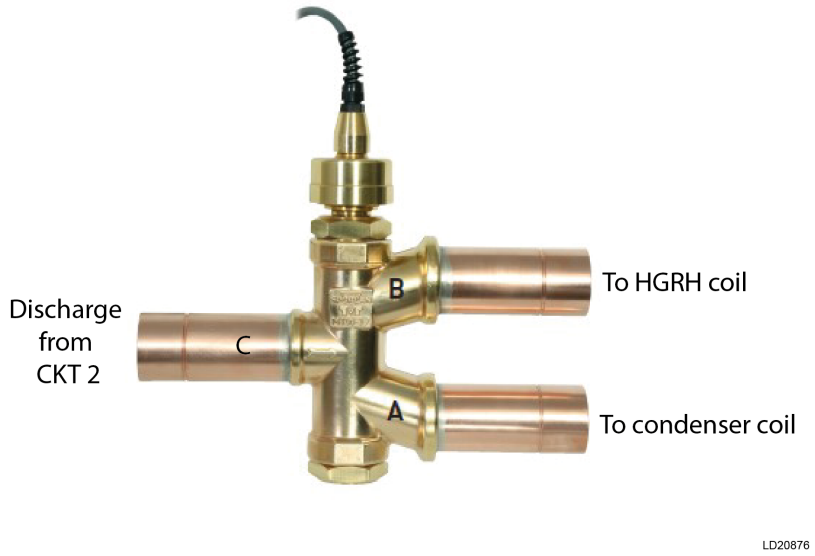


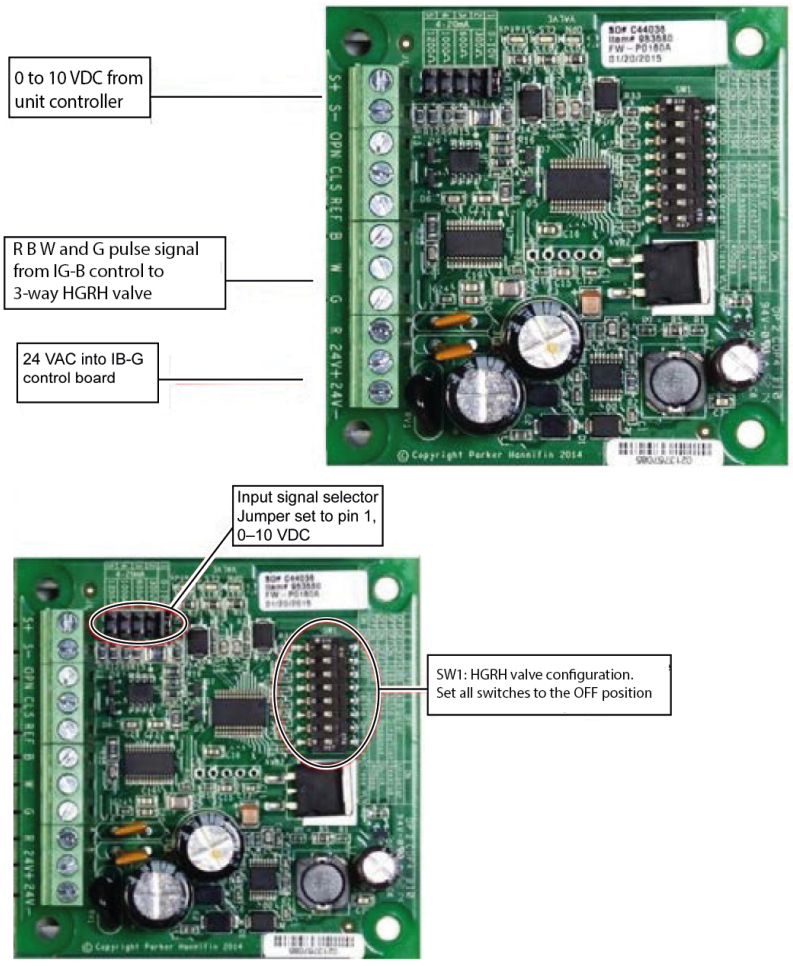
Table 31: Minimum and maximum positions for System 2

Unit size (ton) (ECO2)	System 2 with one compressor on		System 2 with two compressors on	
	Minimum position	Maximum position	Minimum position	Maximum position
70	25%	95%	25%	95%
75				
80				
90				
105				

HGRH control board

- The HGRH controller is factory installed and programmed. No field setup is required.
- The HGRH control board is powered by 24 VAC.
- The HGRH control board receives a 0 to 10 VDC signal from the IPU board. The HGRH control board then sends pulse signals to the three-way stepper valve to modulate open/closed.
- TB9-11 and TB9-12 sends a 0 to 10 VDC signal.
- The HGRH control board has the following three LEDs:
    - Red LED: This status LED is lit whenever there is 24 VAC present.
    - Yellow LED: This closed LED is only lit when the three-way valve is fully closed.
    - Green LED: This valve open LED flashes in different sequences depending on the valve position:
        - One flash: the valve position is between 0 to 10%.
        - Two flashes: the valve position is between 10 to 20%.
        - Three flashes: the valve position is between 20 to 30%.
        - Four to ten flashes: follow the previous three steps.
        - The green LED remains lit whenever the valve is fully open.

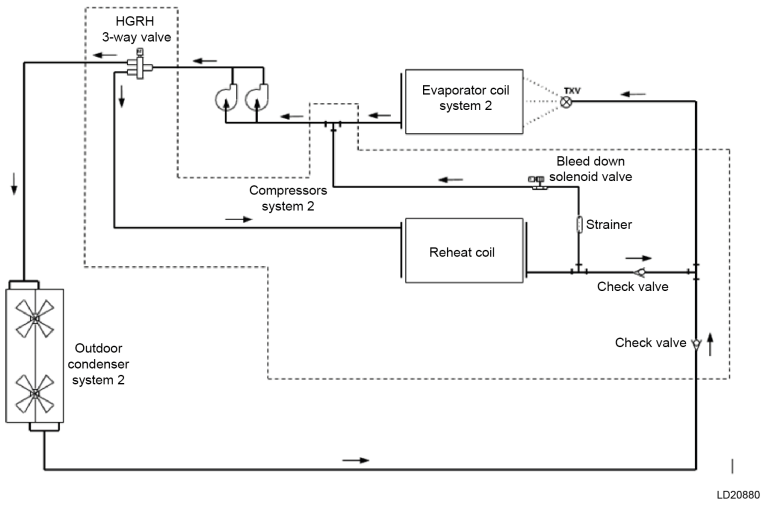
Figure 40: HGRH control board



HGRH bleed solenoid

- The HGRH bleed solenoid is powered by 24 VAC.
- The HGRH bleed solenoid is piped in between the HGRH coil and the suction line for CKT 2.
- The valve bleeds off any remaining or trapped liquid in the HGRH coil when HGRH is inactive.
- It is a normally closed valve that opens (energizes) whenever HGRH is inactive.
- There is a 5 minute delay before opening the valve after HGRH becomes inactive.

Figure 41: HGRH piping layout



HGRH setup

- HGRH is a factory-installed option. No field installation kits are available.
- In ***Options*** > ***Unit Data Menu***, the unit type is set to either Single Zone VAV or Variable Air Volume.
- In ***Options*** > ***Unit Data Menu***, HGRH is set to Installed.
- In ***Program*** > ***Unit Data Menu***, HGRH Control is set to User Enabled.
- In ***Setpoints*** > ***Cooling Menu***, enter the following setpoints:
    - Evap Air Temp High and Evap Air Temp Low
    - Low RARH and High RARH
    - HGRH SAT High and HGRH SAT Low
- The unit has the following factory-installed sensors:
    - An RA temperature or humidity sensor
    - An SA humidity sensor
    - An Evap Air temperature sensor. This sensor is four thermistors wired in an averaging network.

HGRH status

The HGRH system is shown in one of five states:

1. User Disabled
    - HGRH Control has been set to User Disabled either at the IPU board or through a BAS command. HGRH operation is not allowed.
2. Inactive: The HGRH status is inactive if any of the following requirements are met:
    - There is no demand for dehumidification.
    - The OAT is less than 54.0°F.

- The Evap Air Temp Active setpoint is greater than or equal to the HGRH Active setpoint minus 4°F and the HGRH valve position is less than or equal to HGRH valve minimum position plus 5%.
- No active HGRH faults exist.

3. Ready: The HGRH status is set to Ready if all of the following requirements are met:

    - A demand for dehumidification exists.
    - Waiting for time delays to expire before becoming active.

4. Active: The HGRH status is set to Active if all of the following requirements are met:

    - All requirements for Ready have been met.
    - No active HGRH faults exist.

5. Faulted: The HGRH status is set to Faulted if any of the following requirement are met:

    - The unit controller determines that there is an active HGRH fault.

6. Inhibited: The HGRH status is set to Inhibited if either of the following conditions are met:

    - The Comp Sys 2 status is disabled by a safety trip, safety fault, safety lockout, low ambient inhibit, or if Suct Temp Unloader is set to Off.
    - WRN-Comp Sys 2 Inhibit is Active.

HGRH sequence of operation

- When HGRH is set to installed and HGRH Control is set to User Enabled, HGRH can operate in both OCC and UNOCC modes. If UNOCC dehumidification is to be used, in ***Program*** > ***Unit Data Menu***, set Night Setback to User Enabled.
- The OAT is equal to or greater than 55°F.
- If the current RA humidity or Zone Humidity Level is greater than Low RARH SP plus 2% RH, HGRH becomes Ready.

    - The unit controller uses the RA relative humidity value if the Zone Humidity value is less than 5% RH.
    - The Zone Humidity Level can be communicated from the BAS (HUM_LVL_BAS - AV61).

- When the HGRH status becomes Ready, the following occurs:

    a. The IPU starts a compressor from either CKT 1 or CKT 2. If CKT 1 is in a Safety Lockout, a compressor from CKT 3 is started.
    b. Approximately 15 seconds later, the IPU starts a compressor from the CKT not selected in the previous step.
    c. Approximately 215 seconds later, the HGRH system becomes active.

- When HGRH is active, the HGRH valve is controlled to maintain the active HGRH SAT SP.
- When HGRH is active, the compressors are controlled to maintain the active Evap Air Temp SP.
- HGRH/Dehum remains active until the current RH value is less than the Low RARH SP minus 2% RH.

- As long as HGRH remains active, a compressor from either CKT 1 or 3 and a compressor from CKT 2 are locked on unless a compressor system fault occurs.

Note: The user has the option of using the factory-installed RA humidity sensor for the active humidity value or providing a zone humidity value from the BAS. If the zone humidity BAS value is greater than 5% relative humidity, the zone humidity BAS value is used to determine dehumidification demand. If the zone humidity value is less than 5% relative humidity, the RA humidity value is used to determine dehumidification demand.

Figure 42: Evaporator air temperature active setpoint versus return air humidity

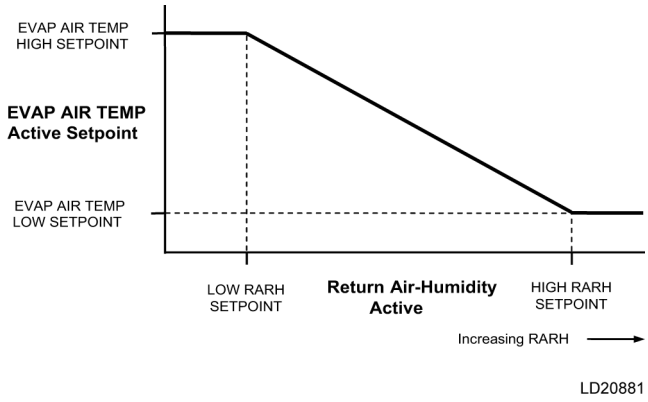
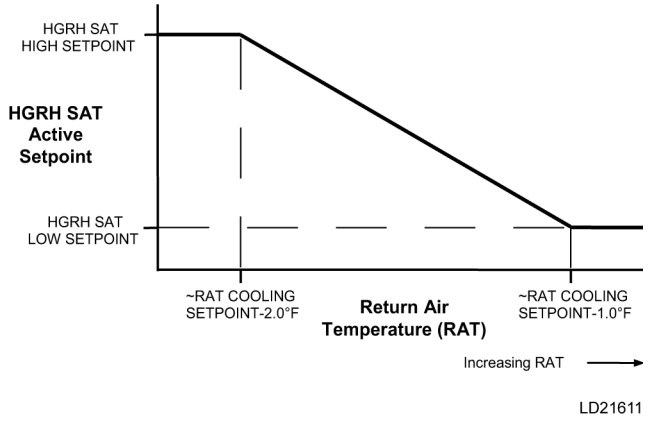


Figure 43: HGRH SAT Active setpoint versus return air temperature



- The HGRH current operating modes are as follows:
  - OCC DEHUM WITH COOL (VAV)
  - OCC DEHUM COOL HIGH (SZVAV)
  - OCC DEHUM COOL LOW (SZVAV)
  - UNOCC DEHUM WITH COOL (VAV)
  - UNOCC DEHUM COOL HIGH (SZVAV)
  - UNOCC DEHUM COOL LOW (SZVAV)

HGRH faults

- The HGRH faults protect compressor system 2 from damage as well as preventing unsatisfactory temperature being delivered to the space.

- The HGRH system has two faults that can occur: Lockout HGRH 1 or 2.

Lockout HGRH 1

- HGRH is installed.
- HGRH status is inactive.
- Either compressor 2A or 2B is running.
- The current SAT is 8.0°F higher than the current evaporator air temperature.

Lockout HGRH 2

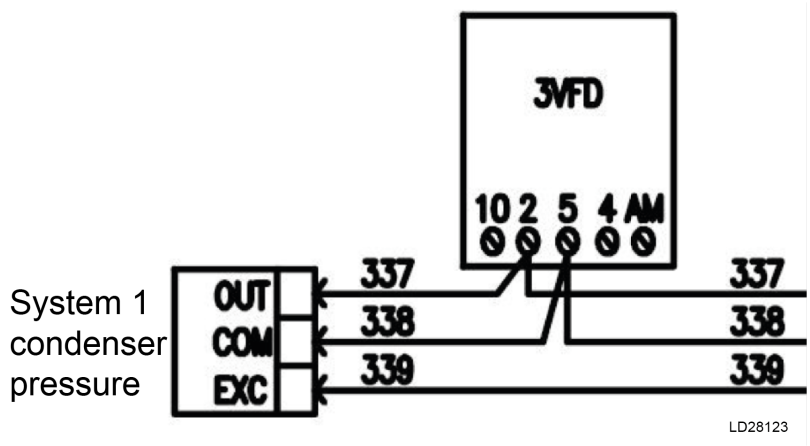
- HGRH is installed.
- HGRH status is active.
- HGRH valve position is greater than 50%.
- The current SAT is 8.0°F less than the current evaporator air temperature.

Condenser fan control

- The rooftop units have six condenser fans installed. There are two condenser fans for each condenser section or V.
- All six condenser fans have their own contactor.
- The condenser fan A in each circuit starts whenever a compressor from that same circuit is started. When condenser fan A has a condenser fan VFD installed, the VFD is powered.
- The condenser fan B in each circuit is controlled by a pressure switch. The pressure switch is wired in series with the condenser fan B contactor.
- The pressure switch closes at 360 psig ± 10 psig and opens at 240 psig ± 10 psig .

Figure 44: Condenser fan contactors — fans 1A and 1B only for compressor system #1

Figure 45: Condenser fan VFD wiring — condenser fan 1A shown



Low ambient kit

- The rooftop units can have an optional factory installed low ambient kit on the compressor circuits.
- Each compressor circuit can have a low ambient kit, but the kits are installed in numerical order:
    - One kit: Circuit 1
    - Two kits: Circuit 1 and 2
    - Three kits: Circuit 1, 2, and 3
- A low ambient kit includes a discharge pressure transducer and condenser fan VFD.
- The condenser fan VFD is a JCI VFD68.
- The VFD68 is not controlled by the IPU board. The 0 to 5 VDC signal from the discharge pressure transducer controls the VFD68.
- The VFD starts to operate condenser fan A at 15 Hz at approximately 270 psig and is at 60 Hz when the discharge pressure is at approximately 370 psig.

Economizer

- The rooftop unit can be ordered with an optional factory installed economizer.
- An economizer provides free cooling during times when the OAT is too cold for mechanical cooling (50.0°F (10°C) or less without low ambient package).
- The economizer sequence is a completely different sequence than ventilation even though both use the outside air damper.
- The unit must be in an Active Cooling mode for the economizer to become active.
- There are three different economizer types:
    a. Dry bulb: Economizer suitability determined by OAT only
    b. Single enthalpy: Economizer suitability determined by OAT and outside air relative humidity
    c. Dual enthalpy: Economizer suitability determined by comparing the OAT and relative humidity against the RAT and relative humidity

- The rooftop unit also has an option for economizer operation called Best Method. Best method operation is explained in Best method.

Economizer setup

- Economizer Installed must be set in the OPTIONS-ECONOMIZER menu.
- Economizer System must be User Enabled in the PROGRAM-ECONOMIZER menu.
- Economizer Method to Use must be set in the PROGRAM-ECONOMIZER menu.

Economizer operation

- The unit must be in an Active Cooling mode for the economizer to function.
- The economizer can override the maximum damper position or outside airflow setpoint of the ventilation type if more outside air is needed to achieve the active cooling SAT setpoint.
- The economizer cannot override the minimum damper position or outside airflow setpoint of the ventilation type.
- The unit can have economizer operation and mechanical cooling operation at the same time if outside air conditions are suitable.

Dry bulb

- Economizer type is dry bulb.
- Economizer is User Enabled.
- The IPU board must see a valid OAT.
- When the current OAT is 2.0°F less than the outside air dry bulb setpoint, the economizer becomes active.
- The IPU board modulates the outside air damper to try to achieve and maintain the active cooling SAT setpoint.

Single enthalpy

- Economizer type is single enthalpy.
- Economizer is User Enabled.
- The IPU board must see a valid OAT and outside air relative humidity.
- When the current OAT is 2.0°F less than the outside air dry bulb setpoint and the current outside air enthalpy is less than the outside air enthalpy setpoint then the economizer becomes active.
- The IPU board modulates the outside air damper to try to achieve and maintain the active cooling SAT setpoint.

Dual enthalpy

- Economizer type is dual enthalpy.
- Economizer is User Enabled.
- The IPU board must see a valid OAT, outside air relative, RAT, and return air relative humidity.
- When the current OAT is 2.0°F less than the outside air dry bulb setpoint and the current outside air enthalpy is 1 BTU per lb less than the return air enthalpy then the economizer becomes active.

- The IPU board modulates the outside air damper to try to achieve and maintain the active cooling SAT setpoint.

Best method

- The IPU board gives the option to set the economizer method to use to best method.
- When set to best method, the IPU board monitors the different sensors used for the three different economizer types. When a sensor reading becomes invalid, the economizer method used switches to a different method.
- For example, when the economizer type is dual enthalpy and the return air humidity sensor reading becomes invalid, the IPU board tries to control the economizer as single enthalpy if the economizer method to use is set to best method.

Heating

- The rooftop unit can be ordered with an optional heating system installed.
- Natural gas is the standard for staged and modulating gas. Optional propane kits can be ordered.
- There are four heating options:

    a. Staged natural gas heat
    b. Modulating natural gas heat
    c. Electric heat
    d. Hot water/steam heat

- Each of these four options has different sub-options that can be ordered, which is covered in further detail under their sections.
- Both natural gas heat options can also be operated with LP (propane) gas with the appropriate conversion kit.

Heating setpoints

- The IPU board looks at different temperature values to determine when there is a heating demand present.
- When the unit type is SZVAV, see Figure 27.
- When the unit type is VAV, see Figure 33 and Figure 34.
- When the unit type is FlexSys, see Figure 57 and Figure 58.

Staged natural/propane gas heat

- Staged natural gas heat can be ordered with one of three heating capacities:

    a. 375 MBH (1 furnace section)
    b. 750 MBH (2 furnace sections)
    c. 1125 MBH (3 furnace sections)

- The heating capacity determines the number of furnaces installed.
- Each furnace has a two-stage gas valve, an ignition control module, and an induced draft fan motor.
- Furnace status back to the IPU board is provided through the multiplexor control.

- Each furnace is able to operate independently of the other furnaces. This means if there is more than one furnace section and one is faulted, the others are still able to operate.

Staged natural gas heat setup

- Set the heating system type to staged gas under the HEATING-OPTIONS menu.
- Set the gas heat capacity to the appropriate selection under the HEATING-OPTIONS menu.
- Ensure that the heating system is User Enabled under the HEATING-PROGRAM menu.

1. SZVAV

    - 1st and 2nd stage heating setpoints must be entered under the SETPOINTS-HEATING menu.
    - Occ and unocc zone heating setpoints must be entered under the SETPOINTS-HEATING menu. This is only when zone control method is set for wired or comm zone temperature.
    - If using Unocc mode, night set-back must be User Enabled.

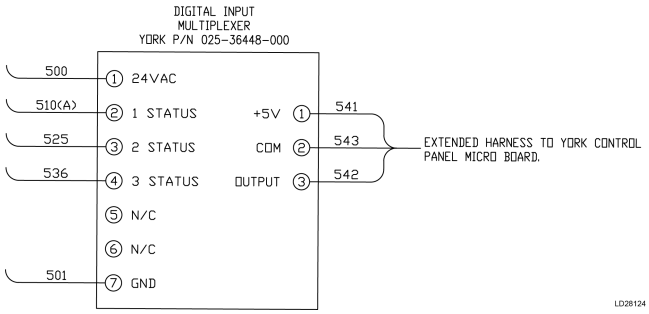
2. VAV

    - RAT heating setpoint must be entered under the SETPOINTS-HEATING menu.
    - SAT heating setpoint must be entered under the SETPOINTS-HEATING menu.
    - For Unocc mode, the IPU board controls to the unocc zone heating setpoint.
    - For Unocc mode, night set-back must be User Enabled.

Table 32: Staged gas heat furnace status

OFF	No demand for heat
PURGE	Induced draft motor is running for 30 seconds
TRY FOR IGNITION	Ignition control is attempting to ignite the burner (7 seconds)
ON-LOW	Furnace is operating normally in Low-Fire mode
ON-HIGH	Furnace is operating normally in High-Fire mode
FAULT	Ignition control did not prove flame, or other safety switch opened
FAULT-LOCKOUT	Multiplexor output to I/O board is not accurate

Figure 46: Digital multiplexor connections for staged gas heat



Staged gas heat sequence of operation

- Once the IPU board determines there is a demand for heat, a 24 VAC signal is sent to furnace 1.
- The inducer motor for furnace 1 starts and makes the pressure switch.

- Once the pressure switch closes, 24 VAC runs through two limit switches and back into the ignition control. This lets the ignition control know that all safety switches are closed.
- There is a 30 second purge timer that allows the inducer motor to flush the furnace with clean air.
- After the 30 second purge timer expires, ignition control simultaneously sends 24 VAC to the low fire solenoid of the gas valve and produces a high voltage spark for 7 seconds to light the burners.
- Furnace 1 gas burners ignite.
- The ignition control monitors the flame signal for 15 seconds.
- After 15 seconds of steady flame rectification, the ignition control sends 24 VAC to the digital multiplexor control, which sends a 0 to 5 VDC signal back to the IPU board. This 0 to 5 VDC signal proves furnace 1 status is good.
- When flame rectification is not established, the ignition control removes the high voltage spark and 24 VAC from the gas valve, waits 30 seconds, and then tries again.
- The ignition sequence is tried three times. When a flame is not established by the third try, the ignition control locks out for 1 hour.
- When more heat is needed, the IPU board sends 24 VAC to a relay in the heating section. This relay closes a set of contacts that energize the high fire solenoid of the gas valve.
- When more heat is still needed and the unit has the available capacity, furnaces 2 and 3 follow the above sequence.

Modulating natural/propane gas heat

- Modulating natural gas heat can be ordered with one of three heating capacities:

    a. 375 MBH (1 furnace section)
    b. 750 MBH (2 furnace sections)
    c. 1125 MBH (3 furnace sections)

- The modulating gas heat option has a turndown ratio of 24:1 with all three furnaces installed
- On modulating gas heat, the first furnace section is always divided into two separate halves: 1A and 1B.

    - Each half of furnace section 1 has its own 2 stage gas valve.
    - Each half of furnace section 1 has its own ignition control.
    - Furnace section 1A is also a modulating gas valve.
    - Furnace sections 1A and 1B shares a 2 speed induced draft motor.
    - The induced draft motor switches between low and high speeds depending on the heating demand.
    - Furnace 1A is always the first ON and last OFF; Furnace 1B is always the last ON and first OFF. When the unit has two or three furnace sections, furnaces 2 and 3 stage ON before furnace 1B stages ON.

- Furnace Position damper and 3 have separate 2 stage gas valves, single speed induced draft motors and ignition controls, if applicable.
- Each furnace is able to operate independently of the other furnaces, except for furnace section 1. When either 1A or 1B is in a fault, both halves are not allowed to operate. Furnace Position damper and 3 are still allowed to operate.

Modulating natural gas heat setup

- Set the heating system type to modulating gas under the OPTIONS-HEATING menu.
- Set the gas heat capacity to the appropriate selection under the OPTIONS-HEATING menu.
- Ensure that Heating System is User Enabled under the PROGRAM-HEATING menu.

1. SZVAV

    - 1st and 2nd stage heating setpoints must be entered under the SETPOINTS-HEATING menu.
    - Occ and unocc zone heating setpoints must be entered under the SETPOINTS-HEATING menu. This is only when zone control method is set for wired or comm zone temperature.
    - If using Unocc mode, night set-back must be User Enabled.

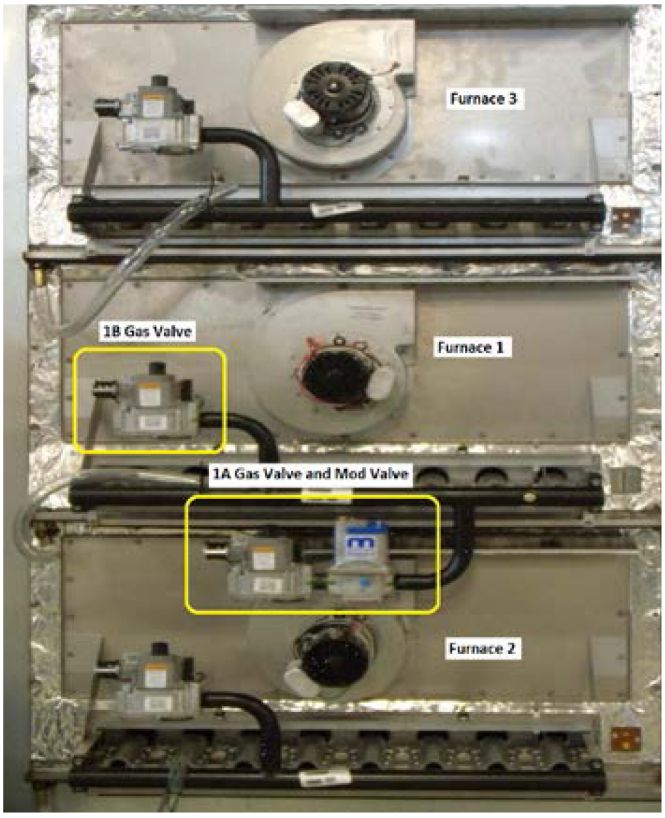
2. VAV

    - RAT heating setpoint must be entered under the SETPOINTS-HEATING menu.
    - SAT heating setpoint must be entered under the SETPOINTS-HEATING menu.
    - For Unocc mode, the IPU board controls to the unocc zone heating setpoint.
    - For Unocc mode, night set-back must be User Enabled.

Table 33: Modulating gas furnace status

OFF	No demand for heat
PURGE	Induced draft motor is running for 30 seconds
TRY FOR IGNITION	Ignition control is attempting to ignite the burner (7 seconds)
ON-LOW	Furnace is operating normally in Low-Fire mode
ON-HIGH	Furnace is operating normally in High-Fire mode
FAULT	Ignition control did not prove flame, or other safety switch opened
FAULT-LOCKOUT	Multiplexor output to I/O board is not accurate

Figure 47: Modulating gas furnace sections



LD28125

Modulating gas heat sequence of operation

- Once the IPU board determines there is a demand for heat, a 24 VAC signal is sent to furnace 1A.
- At the same time, the IPU board sends a 24 VAC signal to the 6R (1A high fire relay).
- The inducer motor for furnace 1A starts on high speed and make both the low and high pressure switches.
- Once the pressure switches close, 24 VAC runs through two limit switches and back into the ignition control. This lets the ignition control know that all safety switches are closed.
- There is a 30 Second Purge Timer that allows the inducer motor to flush the furnace with clean air.
- After the 30 Second Purge Timer expires, the ignition control:

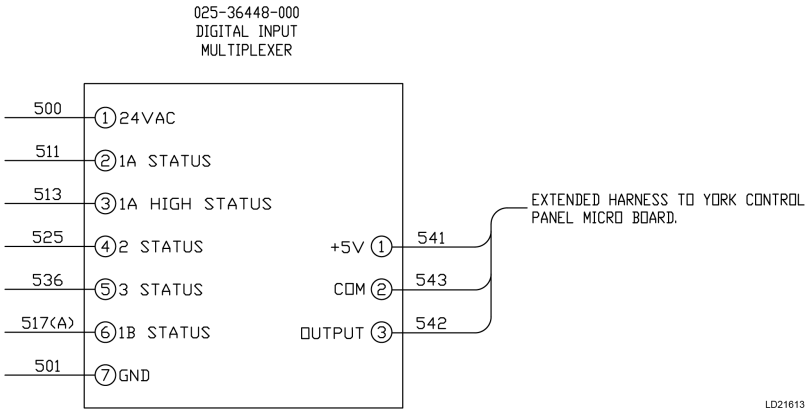
    a. Sends 24 VAC to the low and high fire solenoid of the gas valve and produces a high voltage spark for 7 seconds.
    b. Modulates the modulating gas valve to minimum high fire.

- Furnace 1A gas burners ignite.
- The ignition control monitors the flame signal for 15 seconds.
- After 15 seconds of steady flame rectification, the ignition control:

    - Sends 24 VAC to the digital multiplexor control, which sends a 0 to 5 VDC signal back to the IPU board. This 0 to 5 VDC signal proves furnace 1A status is good.

- Once the IPU board receives the appropriate VDC signal from the digital multiplexer control, the IPU board removes 24 VAC from the 6R relay, which causes:
    a. The induced draft motor to switch to low speed
    b. The modulating gas valve to switch to minimum low fire
- Furnace 1A is now in Modulation mode.
- When flame rectification is not established, the ignition control removes the high voltage spark and 24 VAC from the gas valve, waits 30 seconds, and then tries again.
- The ignition sequence is tried three times. When a flame is not established by the third try, the ignition control locks out for 1 hour.
- Furnace Position damper, 3, and 1B follow the same sequence as staged gas heat.

Figure 48: Digital multiplexor connections for modulating gas heat



Modulating operation

- Once Furnace 1A has successfully ignited, the IPU board enters the normal modulating heat sequence.
- On a modulating gas heat unit. furnace 1A is always the first ON and last OFF.
- Furnace 1A has a two-stage gas valve and a modulating gas valve controlled by a Maxitrol® Signal Conditioner.

- The signal conditioner receives a 0 to 10 VDC signal from the IPU board depending on the required heating demand.

1. Furnace 1A low fire

    - Furnace 1A starts with the low fire solenoid of the two-stage gas valve being energized.
    - Modulating gas valve at minimum position at approximately 0.5 to 2 VDC from the IPU board.
    - The inducer motor is on low speed.
    - When the heating demand increases, the 0 to 10 VDC signal increases, which further opens the modulating valve.
    - When the heating demand decreases, the 0 to 10 VDC signal decreases, which closes the modulating gas valve.
    - Modulating gas valve is at maximum position at approximately 6.5 VDC from the IPU.
    - When more heat is needed, furnace 1A switches to high fire.

2. Furnace 1A high fire

    - The IPU energizes the high fire solenoid of the two-stage gas valve.
    - Modulating gas valve at minimum position, approximately 4 to 4.5 VDC from the IPU board.
    - The inducer motor switches to high speed.
    - When the heating demand increases, the 0 to 10 VDC signal increases, which further opens the modulating valve.
    - When the heating demand decreases, the 0 to 10 VDC signal decreases, which closes the modulating gas valve.
    - The modulating gas valve is at maximum position at approximately 8 to 9 VDC from the IPU board.
    - When more heat is needed, the IPU board brings on the next stage depending on the gas heat capacity.

3. 375 MBH

    - On a 375 MBH unit, there is only one furnace section split into two halves: 1A and 1B.
    - Once furnace 1A has reached high fire max position, furnace 1B is ignited.
    - Furnace 1A stays on high fire but the modulating valve is modulated between minimum (4 to 4.5 VDC) and maximum (8 to 9 VDC) positions.

4. 750 MBH

    - On a 750 MBH unit, there are two furnace sections.
    - Furnace 1 is one section split into two halves: 1A and 1B.
    - Once furnace 1A has reached high fire max position, furnace 2 is started on low fire.
    - Furnace 1A starts at low fire min and goes through the low fire to high fire sequence as described above.
    - When more heat is still needed, furnace 2 switches to high fire and furnace 1A starts at low fire min and goes through the low fire to high fire sequence as described above.

- When more heat is needed and furnace 2 is on high fire and furnace 1A is at high fire max, the IPU brings on furnace 1B and furnace 1A follows the sequence listed under 375 MBH.

5. 1125 MBH

- On a 1125 MBH unit, there are three furnace sections.
- Furnaces 1 and 2 are described as above.
- Furnace 3 is an exact match of furnace 2.
- Once Furnace 2 is at high fire,and furnace 1A is at high fire max, furnace 3 is started on low fire.
- The same sequence is followed on furnace 3 and furnace 1A and 1B as listed above in the 750 MBH sequence.
- Furnace 2 remains at high fire during the furnace 3 sequence as long as the heating demand keeps increasing.

Figure 49: Modulating gas heat staging sequence

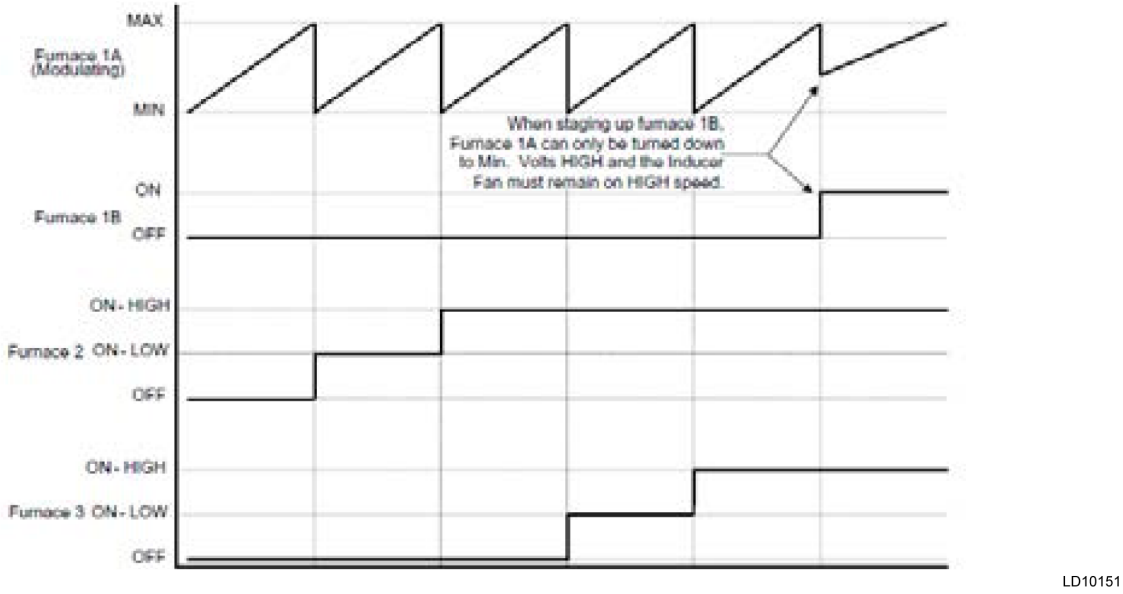


Figure 50: Digital multiplexor control board

LD28126

Digital multiplexer control board

- A rooftop unit equipped with either staged or modulating gas heat utilizes a digital multiplexer control board.
- The digital multiplexer control monitors numerous 24 VAC inputs and then uses these inputs to send a 0 to 5 VDC signal back to the IPU board.
- The IPU board uses this 0 to 5 VDC signal to determine the status of the different furnace sections.

Understanding and troubleshooting the digital multiplexer control board

1. TB1 and LED Lights DS1-DS6

    - TB1 is used for the 24 VAC inputs from the different sections in the unit.
    - TB1 inputs on staged gas heat:

        - TB1-1: 24 VAC input from T5 transformer (DS1 is lit)
        - TB1-2: 24 VAC input from furnace 1, DS2 is lit (375 MBH heating capacity)
        - TB1-3: 24 VAC input from furnace 2, DS3 is lit (750 MBH heating capacity)
        - TB1-4: 24 VAC input from furnace 3, DS4 is lit (1125 MBH heating capacity)
        - TB1-5: Not used on staged gas heat
        - TB1-6: Not used on staged gas heat
        - TB1-7: 24 VAC common from T5 transformer

    - TB1 inputs on modulating gas heat:

        - TB1-1: 24 VAC input from T5 transformer (DS1 is lit)
        - TB1-2: 24 VAC input from furnace 1A, DS2 is lit (375 MBH heating capacity)
        - TB1-3: 24 VAC input from furnace 1A high, DS3 is lit (375 MBH heating capacity)
        - TB1-4: 24 VAC input from furnace 2, DS4 is lit (750 MBH heating capacity)
        - TB1-5: 24 VAC input from furnace 3, DS5 is lit (1125 MBH heating capacity)
        - TB1-6: 24 VAC input from furnace 1B, DS6 is lit (375, 750, or 1125 MBH heating capacity)

        - TB1-7: 24 VAC common from T5 transformer

    - The 24 VAC inputs are provided from the V1 terminals of the ignition controls, except for the 1A high, which is provided when the PS2 pressure switch closes. PS2 pressure switch closes when the induced draft motor on furnace section 1 is on high speed.
    - VAC must be present at TB1-1 and TB1-7 for the multiplexer to function properly. DS1 LED is lit when 24 VAC is present at TB1-1 and TB1-7.

2. TB2 and LED Light DS7

    - TB2 is used to output a 0 to 5 VDC signal back to the IPU board.
    - TB2 outputs on staged and modulating gas heat:

        - TB2-1: 5 VDC power from IPU board
        - TB2-2: 5 VDC common to IPU board
        - TB2-3: 0 to 5 VDC signal back to IPU board

    - VDC must be present at TB2-1 and TB2-2 for the multiplexer to function properly. DS7 LED is lit when 5 VDC is present at TB2-1 and TB2-2.
    - When 5 VDC is not present at TB2-1 and TB2-2, neither DS1 or DS7 are lit.

Table 34: Staged gas heat 0 to 5 VDC outputs to IPU

Min volts DC	Max volts DC	Furnace 1 status	Furnace 2 status	Furnace 3 status
0.086	0.166	OFF	OFF	OFF
0.224	0.313	ON	OFF	OFF
0.361	0.461	OFF	ON	OFF
0.499	0.609	ON	ON	OFF
0.637	0.756	OFF	OFF	ON
0.774	0.904	ON	OFF	ON
0.912	1.051	OFF	ON	ON
1.050	1.199	ON	ON	ON

Table 35: Modulating gas heat 0 to 5 VDC outputs to IPU

Min volts DC	Max volts DC	Modulating furnace 1A status	Furnace 1A status	Furnace 2 status	Furnace 3 status	Furnace 1B status
0.086	0.166	OFF	OFF	OFF	OFF	OFF
0.224	0.313	ON	OFF	OFF	OFF	OFF
0.361	0.461	OFF	ON	OFF	OFF	OFF
0.499	0.609	ON	ON	OFF	OFF	OFF
0.637	0.756	OFF	OFF	ON	OFF	OFF
0.774	0.904	ON	OFF	ON	OFF	OFF
0.912	1051	OFF	ON	ON	OFF	OFF
1.050	1.199	ON	ON	ON	OFF	OFF
1.187	1.346	OFF	OFF	OFF	ON	OFF
1.325	1.494	ON	OFF	OFF	ON	OFF
1.463	1.641	OFF	ON	OFF	ON	OFF
1.600	1.789	ON	ON	OFF	ON	OFF
1.738	1.936	OFF	OFF	ON	ON	OFF
1.876	2.084	ON	OFF	ON	ON	OFF
2.013	2.231	OFF	ON	ON	ON	OFF
2.151	2.379	ON	ON	ON	ON	OFF
2.289	2.526	OFF	OFF	OFF	OFF	ON
2.426	2.674	ON	OFF	OFF	OFF	ON
2.564	2.821	OFF	ON	OFF	OFF	ON

Table 35: Modulating gas heat 0 to 5 VDC outputs to IPU

Min volts DC	Max volts DC	Modulating furnace 1A status	Furnace 1A status	Furnace 2 status	Furnace 3 status	Furnace 1B status
2.702	2.969	ON	ON	OFF	OFF	ON
2.839	3.116	OFF	OFF	ON	OFF	ON
2.977	3.264	ON	OFF	ON	OFF	ON
3.115	3.411	OFF	ON	ON	OFF	ON
3.252	3.559	ON	ON	ON	OFF	ON
3.390	3.706	OFF	OFF	OFF	ON	ON
3.528	3.854	ON	OFF	OFF	ON	ON
3.665	4.001	OFF	ON	OFF	ON	ON
3.803	4.149	ON	ON	OFF	ON	ON
3.941	4.296	OFF	OFF	ON	ON	ON
4.078	4.444	ON	OFF	ON	ON	ON
4.216	4.592	OFF	ON	ON	ON	ON
4.354	4.739	ON	ON	ON	ON	ON

Troubleshooting the multiplexer control board

- Ensure the digital multiplexer control board has both 5 VDC power and 24 VAC power at the appropriate terminals.
- The board does not function properly if both 24 VAC and 5 VDC are not present.
- A quick check of this can be made by looking at the DS1 and DS7 LEDs. When both LEDs are lit, both power sources are present.
- When 5 VDC is not present, neither DS1 nor DS7 is lit. When 5 VDC is present but 24 VAC is not, only DS7 is lit.
- Digital multiplexer warnings:
    - WRN-FURNACE MULTIPLEXER FAULT (used when the unit has modulating gas heat)
    - WRN-GAS FURNACE (used when the unit has staged gas heat)
- Ensure the unit's heating capacity matches what is set under the HEATING menu:
    - On modulating gas heat, furnace 1 is divided into two halves: 1A and 1B. This correlates to one heating section and the heating capacity is 375 MBH. A 750 MBH capacity is used with furnace sections 1A, 1B, and 2. A 1125 MBH capacity is used with furnace sections 1A, 1B, 2, and 3.
    - On staged gas heat, 375 MBH is used with furnace section 1. A 750 MBH capacity is used with furnace sections 1 and 2. A 1125 MBH capacity is used with furnace sections 1, 2, and 3.
    - When a particular furnace section is lighting and one of the above warnings is present, check for the proper 24 VAC input at TB1 of the digital multiplexer control board. When the 24 VAC input is not present, check for loose or broken wires or loose connections.
    - When the proper 24 VAC input is present at TB1, check for the proper 0 to 5 VDC output from TB2. When the proper 0 to 5 VDC output is present at TB2, check for the 0 to 5 VDC signal at the IPU board.
    - See Table 34 and Table 35 for staged and modulating gas output signals.

Electric heat

- The rooftop unit can be ordered with optional electric heat.

- There are numerous electric heat capacities available:
    - 40 kW
    - 80 kW
    - 100 kW
    - 120 kW
    - 160 kW
    - 200 kW
    - 240 kW
- The electric heat capacity determines the number of electric heaters installed.

Electric heat setup

- Set the heating system type to electric under the OPTIONS-HEATING menu.
- Set the Electric Heat Capacity to the appropriate selection under the OPTIONS-HEATING menu.
- Ensure that Heating System is User Enabled under the PROGRAM-HEATING menu.

1. SZVAV
    - 1st and 2nd stage heating setpoints must be entered under the SETPOINTS-HEATING menu.
    - Occ and unocc zone heating setpoints must be entered under the SETPOINTS-HEATING menu. This is only if zone control method is set for wired or comm zone temperature.
    - If using Unocc mode, night set-back must be User Enabled.
2. VAV
    - RAT heating setpoint must be entered under the SETPOINTS-HEATING menu.
    - SAT heating setpoint must be entered under the SETPOINTS-HEATING menu.
    - For Unocc mode, the IPU board controls to the unocc zone cooling and heating setpoints.
    - For Unocc mode, night set-back must be User Enabled.

Electric heat sequence of operation

- Once the IPU board determines there is a demand for heat, a 24 VAC signal is sent to the electric heater.
- The electric heat contactor energizes, which energizes a stage of electric heat.
- The IPU board monitors the active heating SAT setpoint.
- Stages of electric heat are energized as needed to achieve and maintain the active heating SAT setpoint.
- Stages of electric heat are de-energized as needed to achieve and maintain the active heating SAT setpoint.
- All electric heaters contain auto-reset and manual reset temperature safety switches. The safety switches are not connected to the IPU board.

Hot water or steam heat

- The rooftop unit can be ordered with an optional hot water or steam coil.
- There are many different coil size options available. The size of the hot water or steam coil does not impact the hot water or steam operation.
- The hot water or steam valve is field provided or installed.
- On a steam coil, the steam trap is field provided or installed.
- A freezestat is factory installed on all rooftop units built with a hot water or steam coil.

Hot water or steam heat setup

- Set the heating system type to hot water or steam under the OPTIONS-HEATING menu.
- Ensure that Heating System is user enabled under the PROGRAM-HEATING menu.
- Set the HW or Steam Valve Action to the appropriate selection under the PROGRAM-HEATING menu:
    - Direct acting: 0 VDC valve is closed; 10 VDC valve is fully open.
    - Reverse acting: 0 VDC valve is fully open; 10 VDC valve is closed.

1. SZVAV
    - First and second stage heating setpoints must be entered under the SETPOINTS-HEATING menu.
    - Occ and unocc zone heating setpoints must be entered under the SETPOINTS-HEATING menu.
    - If using Unocc mode, night set-back must be user enabled.
2. VAV
    - RAT heating setpoint must be entered under the SETPOINTS-HEATING menu.
    - SAT heating setpoint must be entered under the SETPOINTS-HEATING menu.
    - For Unocc mode, the IPU board controls to the unocc zone cooling and heating setpoints.
    - For Unocc mode, night set-back must be user enabled.

Hot water or steam heat sequence of operation

- Once the IPU board determines there is a demand for heat, the IPU board sends a 0 to 10 VDC signal to the field installed hot water or steam valve.
- The IPU board increases or decreases the 0 to 10 VDC signal trying to achieve and maintain the active heating SAT setpoint.
- The IPU board monitors the status of the factory installed freezestat to prevent coil freezing of the hot water or steam coil.

Freeze protection

- On rooftop units with hot water/steam coils, the IPU board has a built in freeze protection sequence.
- The freeze protection sequence is not adjustable.

- There are two different sequences for freeze protection:
    a. Supply fan ON, heating is inactive
        i. When the supply fan is running, the IPU board monitors the current SAT.
        ii. When the current SAT becomes equal to/less than 38.0°F, the IPU board sends a 0 to 10 VDC signal to open the hot water/steam valve to maintain the current SAT at 38.0°F.
    b. Supply fan OFF, heating is inactive
        i. When the supply fan is OFF, the IPU board monitors the current OAT.
        ii. When the current OAT becomes equal to/less than 40.0°F, the IPU board sends a 0 to 10 VDC signal to the hot water/steam valve to fully open the valve.

Freeze fault

- The IPU board monitors the status of the factory installed freezestat.
- When the freezestat is ON (open), it closes on when the temperature drops to 35.0°F.
- When the freezestat closes for 10 seconds, the IPU board fully opens the hot water/steam valve, and a WRN- TRIP FREEZESTAT is declared.
- The IPU starts a 5 minute Freeze Trip Timer.
- If at any time during this 5 minutes, the freezestat returns to normal operation, open, the unit resumes normal operation and the warning is cleared.
- If the freezestat remains closed for 5 minutes, the IPU shuts down the unit and a Lockout-Hot Water Freeze Fault is declared.

Heating sequences

- The rooftop unit has several different sequences associated with the different heating options.
- Each of these sequences can be User Enabled/User Disabled in the PROGRAM-HEATING menu.
- They can also be User Enabled/User Disabled through a BAS.

Morning warm-up

- Morning warm-up is a sequence that typically warms a building to a comfortable temperature before personnel arrive.
- The morning warm-up sequence on rooftop units can only be started from an Unocc mode.
- Morning warm-up can be started either from the IPU board internal schedule or from a BAS.

Morning warm-up setup

- The rooftop unit must have one of the optional heating types installed.
- Morning warm-up must be User Enabled in the PROGRAM-HEATING menu.
- Morning warm-up uses the current RAT to determine if the heating source should be turned ON.

Morning warm-up sequence of operation

- The current unit mode must be Unocc Standby.
- A command for morning warm-up must be received from either the BAS or the internal clock schedule.
- Once the IPU board receives the morning warm-up command, the supply fan starts (the return fan also starts if installed).
- The supply fan is controlled as follows:

    a. VAV or FlexSys: To the active duct static pressure setpoint
    b. SZVAV: At 100%

- After the supply is ON for 5 minutes, the IPU board compares the current RAT to the active RAT heating setpoint.
- When the current RAT is equal to/less than the active RAT setpoint minus 1.0°F, the unit's heating source is turned ON.
- The heating source is controlled to the following setpoints:

    a. VAV or FlexSys: SAT heating
    b. SZVAV: 2nd stage heating

- The heating source is turned OFF when the current RAT is equal to/greater than the active RAT heating setpoint plus 0.5°F.
- The heating source is also turned OFF when the morning warm-up command is removed or the unit enters an Occ mode.

Adaptive morning warm-up

Adaptive morning warm-up is only used when the rooftop unit is using an internal programming schedule to determine Occ and Unocc modes.

With adaptive morning warm-up, the IPU board calculates the start time to ensure that the RAT is within 0.5°F of the RAT heating setpoint when the unit switches to an Occ mode. This is accomplished by calculating the Morning Warm-Up Optimal Start Time by averaging the amount of time it takes to bring the RAT within 0.5°F of the RAT heating setpoint for three consecutive days. The three warm-up times are averaged and added to a 10 minute offset. The new time is used as the Morning Warm-Up Optimal Start Time for the next day.

Adaptive morning warm-up setup

- *Occupancy schedule* MUST be programmed for the Occ and Unocc start and stop times through the SCHEDULE key.
- *Occupancy schedule* MUST be User Enabled.
- Morning warm-up MUST be User Enabled.
- Adapt morning warm-up MUST be User Enabled.
- *RAT heating* setpoint MUST be set.
- *Morning warm-up max time* MUST be set.
- When the *morning warm-up opt time* exceeds the *morning warm-up max time,* the *morning warm-up opt time* becomes the *morning warm-up max time.*
- When the *morning warm-up opt time* is determined to be less than 15 minutes, the *morning warm-up opt time* becomes 15 minutes.

- The default values for *daily warm up time [day 1], [day 2], [day 3]* shall be initially set to 60 minutes.
- These values can be reset to the default values by turning morning warm-up to User Disabled, then back to User Enabled.

Adaptive morning warm-up sequence of operation

Note: It is recommended that all VAV or underfloor boxes are open to their maximum position during morning warm-up operation.

- The rooftop unit MUST be in an Unocc mode before morning warm-up can be initiated.
- The IPU board starts the morning warm-up sequence.
- The supply fan starts. When configured for VAV or Flexsys, the supply fan VFD is controlled to the *active duct static pressure* setpoint.
- When the RAT is greater than the *RAT heating* setpoint minus 1.0 °F, the IPU board does not energize the heating sequence and it sets the Daily Warm Up Time to 5 minutes.
- When the RAT is less than or equal to the *RAT heating* setpoint minus 1.0 °F, the IPU board energizes the heating sequence based on the Morning Warm-Up Optimal Start Time.
- Once the heating medium is started, the *active SAT* setpoint is controlled as follows:
    - VAV or Flexsys: To the *heating SAT setpoint*
    - SZVAV: To the *2nd stage heating* setpoint.
- The heating medium remains ON until
    - The RAT is greater than or equal to the *RAT heating* setpoint plus 0.5 °F
        - OR
    - The morning warm-up command is removed
        - OR
    - The rooftop unit enters an Occ mode

Supply air tempering

- This sequence uses the unit heating source to temper the supply air during the winter months when a large volume of outside air is required for ventilation.
- It is only applicable on VAV and FlexSys configured units.
- SZVAV units utilize the comfort ventilation sequence. Refer to Comfort ventilation for a description of this sequence.
- Supply air tempering works best with either modulating gas or hot water/steam since the heat output can be modulated down to a bare minimum.

Supply air tempering setup

- The rooftop unit must have a heating source installed.
- The heating source must be User Enabled.
- Supply air tempering must be User Enabled in the PROGRAM-COOLING menu.

Supply air tempering sequence of operation

- The supply air tempering sequence is slightly different depending on the heating source. The following sections detail the different sequences.

Modulating gas and hot water or steam heat

- The IPU board monitors the current SAT.
- Supply air tempering becomes ACTIVE when the current SAT (mixed SAT for FlexSys) becomes 2.5°F colder than the active cooling SAT setpoint (mixed SAT setpoint for FlexSys) for 5 minutes.
- The heating source is turned ON when both conditions below are satisfied:
    - The economizer output is less than 5%
    - There has been no compressor operation for 10 minutes
- The heating source is controlled to the active cooling SAT setpoint (mixed SAT setpoint for FlexSys).
- Supply air tempering becomes INACTIVE when the following conditions are satisfied:
    a. Modulating gas heat
        - The current SAT (mixed SAT for FlexSys) becomes 4.0°F warmer than the active cooling SAT setpoint (mixed SAT setpoint for FlexSys) for 4 minutes.
        - Modulating gas heat is at minimum low fire.
    b. Hot water or steam heat
        - The current SAT (mixed SAT for FlexSys) becomes 4.0°F warmer than the active cooling SAT setpoint (mixed SAT setpoint for FlexSys) for 4 minutes.
        - The hot water or steam valve position is less than 2%

Staged gas and electric heat

- The IPU board monitors the current SAT.
- Supply air tempering becomes ACTIVE when both conditions below are satisfied:
    a. The current SAT (mixed SAT for FlexSys) becomes 2.5°F colder than the active cooling SAT setpoint (mixed SAT setpoint for FlexSys) for 5 minutes.
    b. The current heat entering temperature is less than the active cooling SAT setpoint (mixed SAT setpoint for FlexSys) for 5 minutes.
- The heating source is turned ON when both conditions below are satisfied:
    a. The economizer output is less than 5%
    b. There has been no compressor operation for 10 minutes
- The heating source is controlled to the active cooling SAT setpoint (mixed SAT setpoint for FlexSys).
- Supply air tempering becomes INACTIVE when the current heat entering temperature becomes greater than the active cooling SAT setpoint for 5 minutes.

Ventilation

- The rooftop unit has several different factory options for fresh air ventilation and two different control options.
- Ventilation is active whenever the rooftop unit is in the Occ mode and the supply fan is running.
- Ventilation is a completely different sequence than the economizer. The economizer sequence is only used when the unit is in an Active Cooling mode.
- When the rooftop unit enters an Active Cooling mode, the economizer can override the maximum outside air damper position if more outside air is needed to satisfy the active cooling SAT setpoint. The economizer cannot drive the outside air damper below the minimum outside air damper setpoint.

Ventilation types (damper hardware)

- The ventilation types are called Damper Hardware in the PROGRAM menu.
- The damper hardware setting determines which type of ventilation system is installed in the unit.
- The rooftop has three different options for damper hardware:

    a. Position damper
    b. Standard damper
    c. TEK-Air full IAQ

ⓘ **Note:** The Rev D rooftop units had three different options for an IAQ station. Those options are still shown in software, but are not applicable to the Rev G units.

Control options

1. Fixed minimum

    - The outside air dampers are controlled to a fixed position depending on the damper hardware selected

2. Demand ventilation

    - The unit was ordered with optional CO_2 sensors.
    - The IPU board monitors the indoor and outdoor CO_2 values. When the indoor CO_2 level becomes greater than the outdoor CO_2 level plus the CO_2 offset setpoint, demand ventilation becomes active.
    - The outside air dampers modulates open and closed based on the ventilation demand.

Ventilation setup

- Damper hardware is set in the OPTIONS-VENTILATION menu.
- Set whether there are CO_2 sensors installed or not installed in the OPTIONS-VENTILATION menu.
- Ventilation sequence is User Enabled/User Disabled in the PROGRAM-VENTILATION menu.
- Control type is set in the PROGRAM-VENTILATION menu.

Position damper

- Ventilation system must be User Enabled set in the PROGRAM-VENTILATION menu.
- Damper hardware must be set to 2 Position under the OPTIONS-VENTILATION menu.
- position damper only works with fixed minimum control type.
- When the ventilation system is active, the IPU board sends a 10 VDC signal to the outside air damper actuator.
- When the ventilation system is inactive, the IPU board removes the 10 VDC signal from the outside air damper actuator.
- The amount of outside air can be adjusted by adjusting the outside air damper linkages.

Standard damper

- Standard damper can be used with either fixed minimum or demand ventilation control types.
- When damper hardware is set to standard with fixed minimum, the position of the outside air damper is determined by the supply fan speed.
- When damper hardware is set to standard with demand ventilation, the position of the outside air damper is determined by the ventilation demand.
- Outside air damper minimum and maximum positions must be set in the SETPOINTS-VENTILATION menu.

Standard damper with fixed minimum control

- Ventilation system must be set to User Enabled set in the PROGRAM-VENTILATION menu.
- Damper hardware must be set to Standard in the OPTIONS-VENTILATION menu.
- Control type must be set to Fixed Minimum set in the PROGRAM-VENTILATION menu.
- When the unit is in an Occ mode and the supply fan is running, the outside air damper is controlled to the following:

    a. Supply fan at 100%: outside air damper at minimum position
    b. Supply fan at 50%: outside air damper at maximum position
    c. Supply fan at a speed between 50% and 100%: outside air damper between minimum and maximum positions

- Be aware that if the economizer is active, it can override this outside air maximum position setpoint to bring in the required outside air to satisfy cooling demand. The economizer cannot drive the outside air damper below the outside air minimum position setpoint.

Standard damper with demand ventilation

- Ventilation system must be set to User Enabled set in the PROGRAM-VENTILATION menu.
- Damper hardware must be set to Standard in the OPTIONS-VENTILATION menu.
- Control type must be set to Demand set in the PROGRAM-VENTILATION menu.
- CO_2 sensors must be set to Installed in the OPTIONS-VENTILATION menu.
- CO_2 offset setpoint must be set in the SETPOINTS-VENTILATION menu.

- When the unit is in an Occ mode and the supply fan is running, the outside air damper is controlled to the following:

    a. Ventilation demand at 0%: outside air damper at minimum position
    b. Ventilation demand at 100%: outside air damper at maximum position
    c. Ventilation demand between 0 and 100%: outside air damper between minimum and maximum positions

ⓘ **Note:** Be aware that if the economizer is active, it can override this outside air max position setpoint to bring in the required outside air to satisfy cooling demand. The economizer cannot drive the outside air damper below the outside air min position setpoint.

Figure 51: Standard damper with fixed minimum

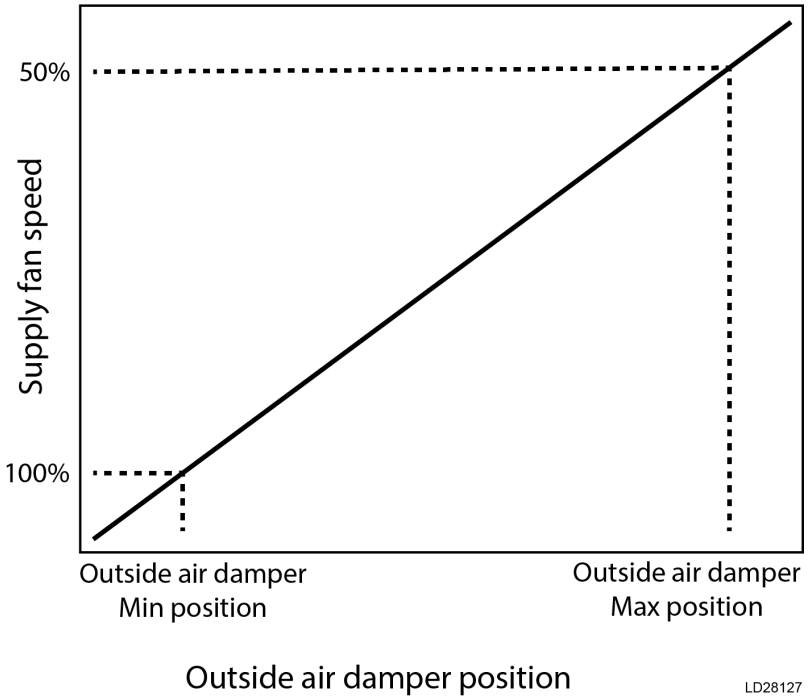
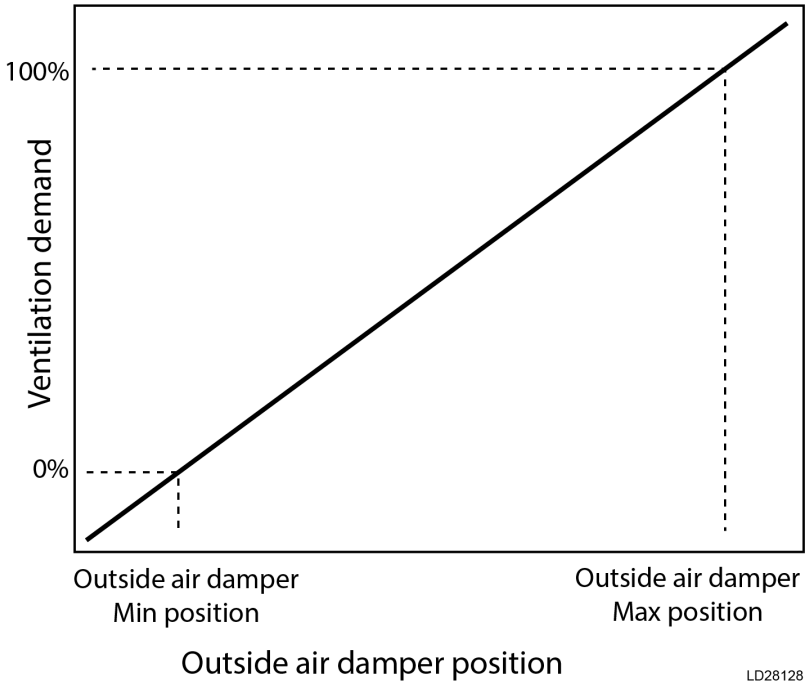


Figure 52: Standard damper with demand ventilation



Tek-Air full IAQ

- The rooftop unit can be ordered with an optional Tek-Air full IAQ air measuring station.
- The Tek-Air monitors the CFM of outside air being drawn through the outside air dampers and control the outdoor air to a specific CFM.
- The Tek-Air can be set-up for either fixed minimum or demand ventilation control.

  Note: Ventilation air should not be set below 1,500 CFM. When set lower than the suggested minimum airflow setpoint, the unit controller may not display a reliable CFM.

Table 36: TEK-Air factory settings

Area of flow device	27.1 sq ft
Sensor flow coefficient	0.762
Altitude	0 feet
Analog out flow setpoint	70–80 ton: 32,000 CFM
	90–105 ton: 36,000 CFM
Press average interval	10 seconds
Use fan interlock	ON
Auto zero interval	30 minutes
Enclosure temp setpoint	120.0°F
Transducer zero	0.00 iwg
Transducer FS	0.25 iwg

- The Tek-Air full IAQ is programmed at the factory for proper operation in the rooftop unit.

Tek-Air full IAQ with fixed minimum

- Ventilation system must be set to User Enabled in the PROGRAM-VENTILATION menu.
- Damper hardware must be set to Tek-Air full IAQ in the OPTIONS-VENTILATION menu.
- Control type must be set to Fixed Minimum in the PROGRAM-VENTILATION menu.
- Minimum flow outside air setpoint must be set in the SETPOINTS-VENTILATION menu.
- When the rooftop unit is in an Occ mode and the supply fan is running, the outside air damper is driven open/closed to maintain the minimum outside airflow setpoint.

ⓘ **Note:** Be aware that if the economizer is active, it can override this outside air max position setpoint to bring in the required outside air to satisfy cooling demand. The economizer cannot drive the outside air damper below the outside air min position setpoint.

Tek-Air full IAQ with demand ventilation

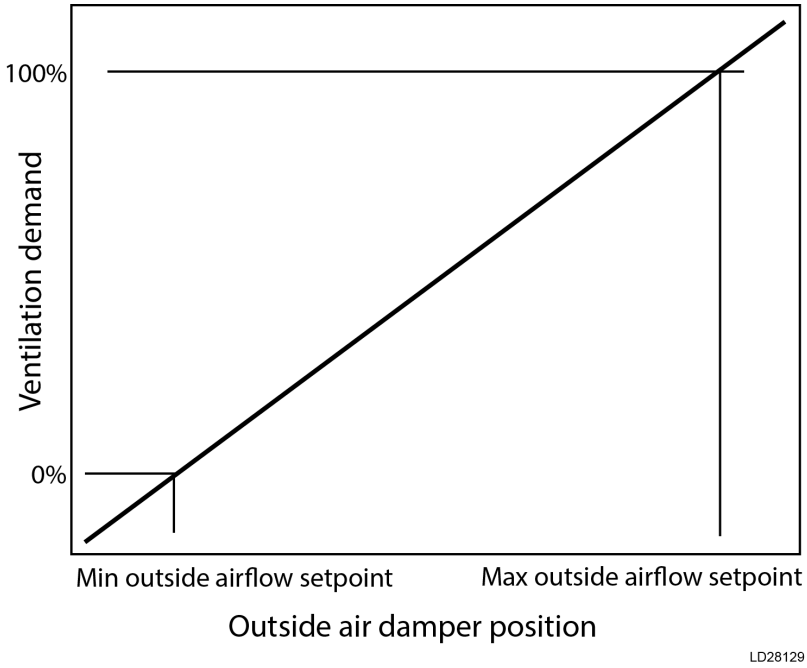
- Ventilation system must be set to User Enabled in the PROGRAM-VENTILATION menu.
- Damper hardware must be set to Tek-Air full IAQ in the OPTIONS-VENTILATION menu.
- Control type must be set to Demand in the PROGRAM-VENTILATION menu.
- CO_2 sensors must be set to Installed in the OPTIONS-VENTILATION menu.
- CO_2 offset setpoint must be set in the SETPOINTS-VENTILATION menu.
- Minimum outside airflow setpoint must be set in the SETPOINTS-VENTILATION menu.
- Maximum outside airflow setpoint must be entered in the SETPOINTS-VENTILATION menu.
- When the rooftop unit is in an Occ mode and the supply fan is running, the outside air damper is driven open/closed as described:

    a. If the ventilation demand is 0%, the outside air damper is controlled to the min outside airflow setpoint
    b. If the ventilation demand is 100%, the outside air damper is controlled to the max outside airflow setpoint
    c. If the ventilation demand is between 0 to 100%, the outside air damper is controlled to a CFM value between the outside airflow min and max setpoints

        ⓘ **Note:** Be aware that if the economizer is active, it can override this outside air max position setpoint to bring in the required outside air to satisfy cooling demand. The economizer cannot drive the outside air damper below the outside air min position setpoint.

        ⓘ **Note:** The Tek-Air full IAQ is sensitive to lower airflow velocities. It is possible that the display goes blank rather than displays a CFM when the outside air drops below the sensitivity of the air measuring station.

Figure 53: TEK-Air full IAQ with demand ventilation



Continuous ventilation

- This sequence is only applicable on SZVAV configured units.
- Continuous ventilation can be User Enabled/User Disabled in the PROGRAM-VENTILATION menu:
    a. User Enabled: The supply fan operates continuously when the unit is in the Occ mode.
    b. User Disabled: The supply fan only operates with a cooling or heating demand when the unit is in the Occ mode.
- When the unit mode is Occ Standby, the supply fan operates at the SZVAV minimum fan speed.
- When the unit is in an Unocc mode, the supply fan only operates with a demand for cooling or heating.

Comfort ventilation

- The comfort ventilation sequence is only applicable on SZVAV configured units.
- Comfort ventilation can be User Enabled/User Disabled in the PROGRAM-VENTILATION menu.
- Comfort ventilation is typically utilized on units that have a large amount of outside air being drawn in for ventilation purposes.
- It has two different modes:
    a. Comfort ventilation cool
    b. Comfort ventilation heat

Comfort vent cool sequence of operation

- Comfort ventilation must be User Enabled in the PROGRAM-VENTILATION menu.
- The unit must be in an Occ mode.
- The unit must have a valid zone temperature reading.
- When the current SAT becomes greater than the occ zone cooling setpoint by 5.0°F, the IPU board starts the unit in occ cooling low.
- When the current SAT becomes less than the occ zone cooling setpoint by 5.0°F for 5 minutes, the IPU board stops comfort ventilation cool.

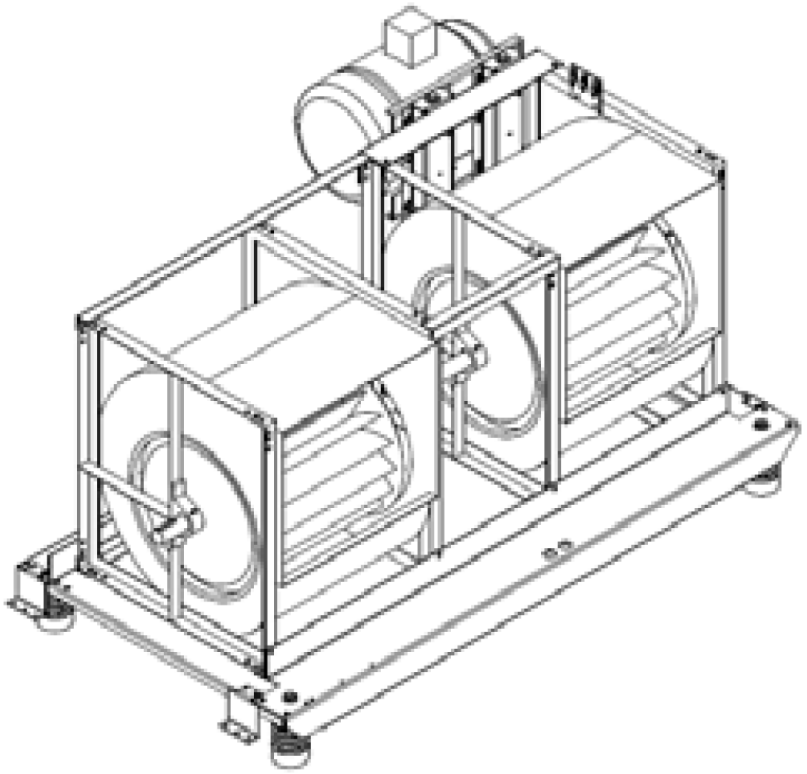
Comfort ventilation heat sequence of operation

- Comfort ventilation must be User Enabled in the PROGRAM-VENTILATION menu.
- The unit must be in an Occ mode.
- The unit must have a valid zone temperature reading.
- If the current SAT becomes less than the occ zone heating setpoint by 5.0°F, the IPU board starts the unit in occ heating low.
- When the current SAT becomes greater than the occ zone heating setpoint by 5.0°F for 5 minutes, the IPU board stops comfort ventilation heat.

Exhaust/return fan

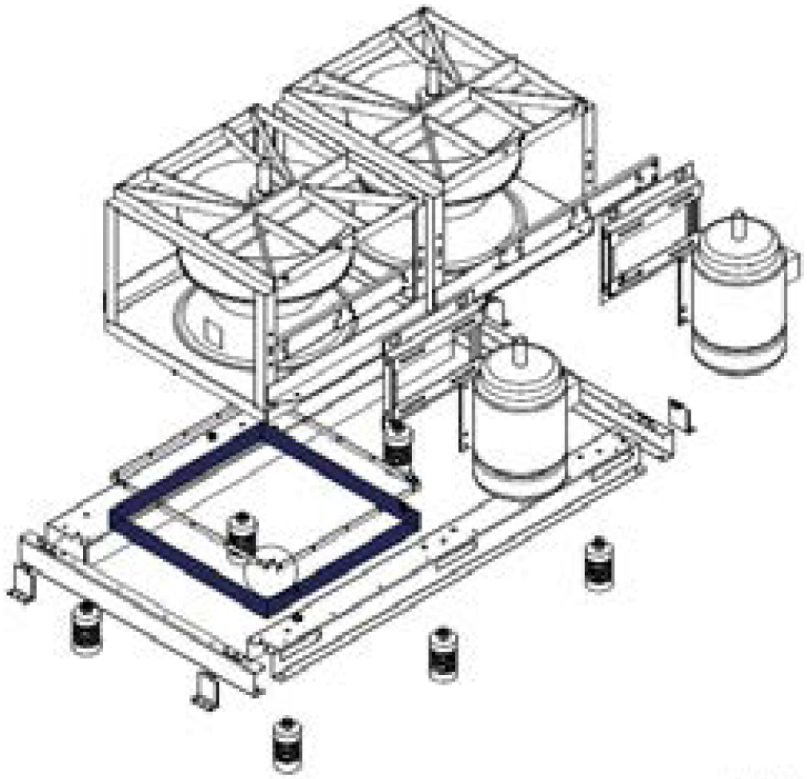
- The rooftop units can be ordered with either an optional exhaust fan assembly or return fan assembly, but not both.
- The exhaust fan assembly may or may not have an exhaust fan VFD.
- An exhaust fan assembly only runs when called for by either damper position or building pressure.
- An exhaust fan assembly has one motor and one VFD that drives two blower wheels. See Figure 54.

Figure 54: Exhaust fan assembly



LD28130

Figure 55: Return fan assembly



LD14363

- The return fan assembly always has a return fan VFD.
- A return fan assembly is ON whenever the supply fan assembly is ON.
- A return fan assembly has one VFD and two motor or blower assemblies. See Figure 55.
- Exhaust fan assembly options are:

    a. On or off control based on outside air damper position (SZVAV only)
    b. On or off control based on building pressure
    c. Modulating damper with single speed exhaust fan
    d. Modulating exhaust fan with barometric damper
    e. If the rooftop unit was ordered as modulating damper - VFD, the exhaust fan can also be controlled from the BAS.

- Return fan assembly options are:

    a. Return fan without exhaust
    b. Return fan with exhaust

Exhaust fan assembly

- The exhaust fan assembly in the rooftop unit is used to control building static pressure.
- The exhaust fan assembly can be ordered as one of four options.
- The exhaust fan assembly only operates with a demand from the building pressure setpoint or the position of the outside air damper.

Exhaust fan assembly setup

- Power exhaust type must be set in the OPTIONS-EXHAUST menu.
- Building pressure setpoint must be set in the SETPOINTS-EXHAUST menu.
- Other setpoints specific to the power exhaust type must be set in the SETPOINTS-EXHAUST menu.

ON/OFF damper control sequence of operation

- Power exhaust type must be set to ON-OFF Damper Control in the OPTIONS-EXHAUST menu.
- Building pressure setpoint must be set in the SETPOINTS-EXHAUST menu.
- Economizer output for fan start must be set in the SETPOINTS-EXHAUST menu.
- Econo output for fan stop must be set in the SETPOINTS-EXHAUST menu.
- This control sequence uses a single speed exhaust fan with a barometric damper.
- When the position of the outside air damper is greater than the economizer output for fan start, the exhaust fan is turned ON.
- When the position of the outside air damper is less than the economizer output for fan stop, the exhaust fan is turned OFF.

ON/OFF building pressure control sequence of operation

- Power exhaust type must be set to ON-OFF Pressure Control in the OPTIONS-EXHAUST menu.
- Building pressure setpoint must be set in the SETPOINTS-EXHAUST menu.
- Building pressure control offset must be set in the SETPOINTS-EXHAUST menu.

- This control sequence uses a single speed exhaust fan with a barometric damper. When the current building pressure is greater than the building pressure setpoint plus the building pressure control offset, the exhaust fan is turned ON.
- When the current building pressure is less than the building pressure setpoint plus the building pressure control offset, the exhaust fan is turned OFF.

Modulating damper - VFD

- This power exhaust type is used for two different sequences:
    a. Modulating damper with single speed exhaust fan
    b. Modulating exhaust fan with barometric damper
- How the unit operates is based on how it was ordered. Both of these sequences utilize the exhaust damper output for controlling the exhaust fan.
    a. Modulating damper with single speed exhaust fan: The 0 to 10 VDC signal is sent from the exhaust damper output to the exhaust damper actuator.
    b. Modulating exhaust fan with barometric damper: The 0 to 10 VDC signal is sent from the exhaust damper output to the exhaust fan VFD.
- The 0 to 10 VDC signal sent from the IPU board directly correlates to a 0 to 100% damper position or VFD speed.
    a. Modulating damper with single speed exhaust fan: For example, a 2.5 VDC signal is an exhaust damper position of 25%.
    b. Modulating exhaust fan with barometric damper: For example, a 2.5 VDC signal is an exhaust fan VFD speed of 25%.

Modulating damper with fixed speed exhaust sequence of operation

- Power exhaust type must be set to Modulate Damper - VFD in the OPTIONS-EXHAUST menu.
- Building pressure setpoint must be set in the SETPOINTS-EXHAUST menu.
- Exhaust output for fan start must be set in the SETPOINTS-EXHAUST menu.
- Exhaust Output for fan stop must be set in the SETPOINTS-EXHAUST menu.
- This sequence uses a modulating exhaust damper with a single speed exhaust fan.
- When the current building pressure becomes greater than the building pressure setpoint, the IPU board starts sending a 0 to 10 VDC signal to the exhaust damper actuator.
- When the exhaust damper position is greater than the exhaust output for fan start, the exhaust fan is turned ON.
- When the exhaust damper position is less than the exhaust output for fan start, the exhaust fan is turned OFF.

Modulating exhaust fan with barometric damper

- Power exhaust type must be set to Modulate Damper - VFD in the OPTIONS-EXHAUST menu.
- Building pressure setpoint must be set in the SETPOINTS-EXHAUST menu.
- Exhaust output for fan start must be set in the SETPOINTS-EXHAUST menu.
- Exhaust output for fan stop must be set in the SETPOINTS-EXHAUST menu.

- When the current building pressure becomes greater than the building pressure setpoint, the IPU board starts sending a 0–10 VDC signal to the exhaust fan VFD.
- Once the exhaust fan speed signal, (exhaust damper position on the LCD screen) is greater than the exhaust output for fan start, the exhaust fan VFD is started.
- Once the exhaust fan speed signal (exhaust damper position on the LCD screen) is less than the exhaust output for fan stop, the exhaust fan VFD is stopped.

Exhaust fan control: BAS sequence of operation

- The rooftop units have the ability to allow a BAS to control the exhaust fan assembly.
- This option allows a controls company to send a BAS signal out to one or more rooftop units, which controls all exhaust fans at the same speed.
- Power exhaust type must be set to Modulate Damper - VFD in the OPTIONS-EXHAUST menu.
- Exhaust control BAS must be User Enabled in the SERVICE menu.
- The BAS sends a 0 to 100% command to the IPU board (BACnet point AV52).
- Once the BAS command is greater than the exhaust output for fan start, the exhaust fan VFD is started.
- Once the BAS command is less than the xhaust output for fan stop, the exhaust fan VFD is stopped.

Return fan assembly

- The rooftop unit can be ordered with an optional return fan assembly.
- The return fan assembly can be ordered as either return fan without exhaust or return fan with exhaust.
- A return fan assembly is typically used on systems where the return duct static pressure is greater than 0.75 iwg.
- A return fan assembly assists the supply fan in drawing the proper amount of return air from the building.
- The return fan runs whenever the supply fan is ON.
- On the rooftop units, the return fan assembly has one VFD controlling two separate return fan assemblies.
- When operating properly, the return fan assemblies are spinning in opposite directions.

Return fan without exhaust sequence of operation

- Power exhaust type must be set to Return Fan without Exhaust in the OPTIONS-EXHAUST menu.
- The return fan speed is controlled by the active return fan plenum pressure setpoint.
- In this sequence, the return plenum pressure setpoint is a fixed value of 0.05 iwg.
- When the supply fan starts, the return fan starts as well.
- The IPU board monitors the return fan plenum pressure and controls the speed of the return fan VFD up/down to maintain the return fan plenum pressure setpoint.

Return fan with exhaust sequence of operation

- Power exhaust type must be set to Return Fan with Exhaust in the OPTIONS-EXHAUST menu.
- Building pressure setpoint must be set in the SETPOINTS-EXHAUST menu.

- Return pressure high setpoint must be set in the SETPOINTS-SUPPLY SYSTEM menu.
- The return fan speed is controlled by the active return fan plenum pressure setpoint.
- When the supply fan starts, the return fan starts as well.
- The return fan speed is controlled as follows:

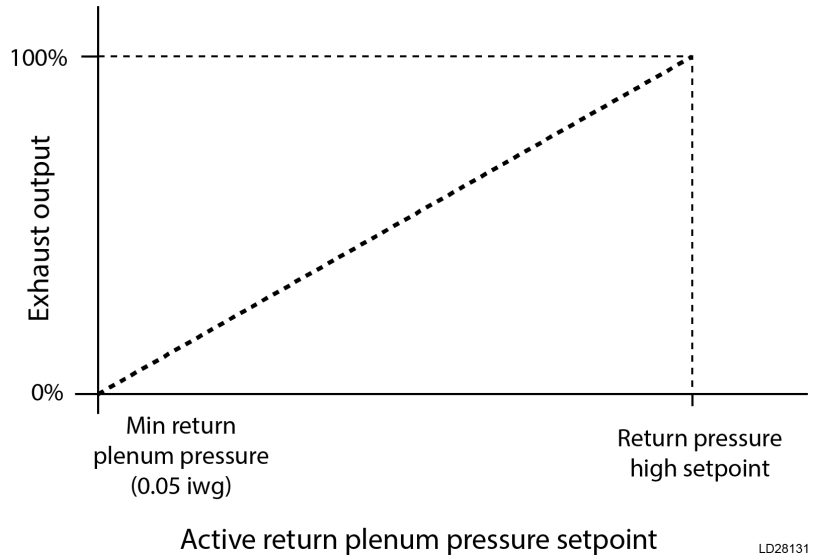
    a. Building pressure less than the building pressure setpoint

        - The return fan speed is controlled to the fixed return plenum pressure setpoint of 0.05 iwg.

    b. Building pressure greater than the building pressure setpoint:

        - The return fan speed is controlled to the active return plenum pressure setpoint.
        - As the building pressure rises above the building pressure setpoint, the Active return plenum pressure setpoint starts to reset to a higher value.
        - When the exhaust demand reaches 100%, the active return plenum pressure setpoint is equal to the return pressure high setpoint. See Figure 56.

Figure 56: Active return plenum pressure setpoint versus exhaust output



FlexSys

- FlexSys is a unit configuration used for HVAC systems that utilize an underfloor plenum to deliver conditioned air to a space.
- The FlexSys configuration allows the rooftop unit to operate in a manner that best suits an underfloor HVAC system.
- It is recommended that a rooftop unit configured for FlexSys operation be paired with other components in the YORK underfloor air distribution (UFAD) system product line for optimum comfort and building control.
- A FlexSys unit needs to have a return air bypass duct and damper installed for proper operation.

- The unit is similar to a standard VAV system, but the conditioned air is delivered to the space from under the floor instead of from overhead ductwork through VAV boxes.
- The underfloor plenum may or may not have underfloor boxes that allow the air up into the space.
- Most sequences on a FlexSys unit operate in the same manner as a VAV unit.
- The cooling sequences and some specialized sequences differ from a VAV unit.

Basic FlexSys system design

- The design of a FlexSys HVAC system is very critical to the proper operation of the rooftop unit.
- Review the following areas that create issues with the proper operation of a FlexSys unit and overall UFAD performance.

1. Plenum integrity

    - "If you make a hole, seal a hole."
    - The underfloor plenum needs to be completely sealed to prevent the conditioned air from escaping.

2. Open plenum returns

    - YORK engineers recommend avoiding open plenum return for a UFAD.
    - Return air should be ducted to the space whenever possible.

3. 6 ft (1.8 m) cooling zone

    - When designing for a UFAD, only the first 6 ft (1.8 m) up from the floor should be conditioned.
    - The remaining area above 6 ft (1.8 m) is used to allow the air to mix with various heat loads in the space.
    - This mixing of air helps to ensure warm enough return air to use in the return air bypass duct.
    - YORK engineers have found during extensive testing that RATs cooler than 78.0°F cannot properly raise the temperature of the air leaving the evaporator coil to the recommended mixed SAT of 62.0 to 64.0°F. The engineers found that mixed SATs lower than 62.0°F are uncomfortable to occupants of a space.

4. **Multiple plenums/one unit**

    - When designing for a UFAD where one unit services different plenums, it is recommended that each separate plenum have its own volume damper controlled by an actuator.
    - Each plenum should also have its own pressure transducer that controls the actuator driven volume damper.
    - Each separate plenum should be maintained at 0.05 iwg.

Factory recommended setpoints

- Since a FlexSys unit delivers air through an underfloor plenum, some of the setpoints differ from a typical VAV unit.

- Table 37 shows recommended setpoints provided by the engineering team, which are supported by extensive testing and research.
- However, these are recommendations only and job-specific setpoints could differ. YORK recommends using these setpoints as a starting point.

Table 37: Recommended setpoints

Setpoint	Temperature (°F)
RAT Cooling	78.0°F
Mixed SAT	62.0 to 64.0°F
EAT High	58.0°F
EAT Low	55.0°F
Duct Static	0.05 in. w.c.
Heating SAT	80.0°F
Max Bypass	40%

Note: On a FlexSys unit, the mixed SAT is the temperature of the supply air off the evaporator coil mixed with the warmer return air that is bypassed around the evaporator coil. The bypassed return air is introduced directly under the supply air fan.

FlexSys setup

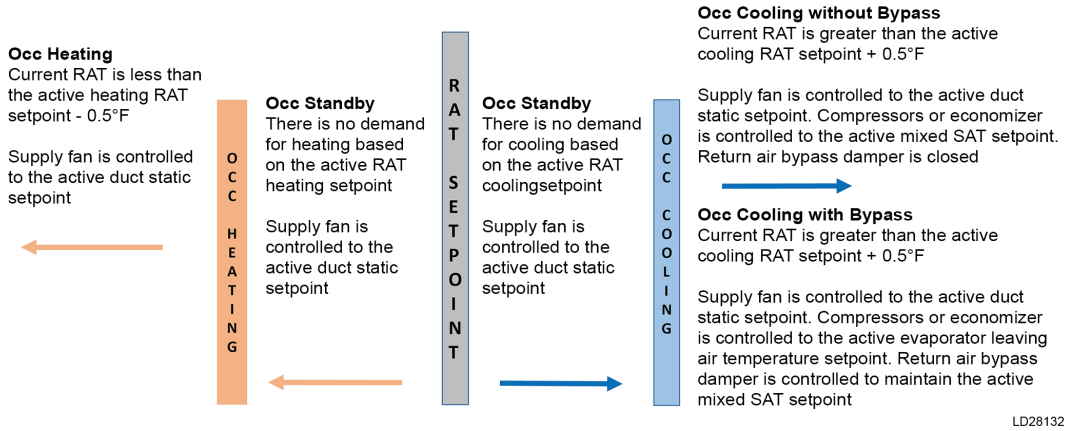
- The settings listed below are unique to FlexSys configured units. Descriptions of the specific sequences can be found later in the section.
- Setpoints such as RAT cooling and RAT heating and others are covered under the appropriate section in this IOM.
- Unit type must be set to FlexSys in the OPTIONS-UNIT DATA menu.
- Dew point reset must be set to User Enabled/User Disabled in the PROGRAM-COOLING menu.
- Active slab control must be set to User Enabled/User Disabled in the PROGRAM-COOLING menu.
- Mixed SAT setpoint must be set in the SETPOINTS-COOLING Menu.
- Return air diff setpoint must be set in the SETPOINTS-COOLING menu.
- Maximum bypass setpoint must be set in the SETPOINTS-COOLING menu.
- Evaporator leaving air temperature high setpoint must be set in the SETPOINTS-COOLING menu.
- Evaporator leaving air temperature low setpoint must be set in the SETPOINTS-COOLING menu.
- Reset enthalpy setpoint must be set in the SETPOINTS-COOLING menu.

Current operating mode

- The current operating mode for a FlexSys configured unit is decided the same as for a VAV configured unit.
- In the Occ mode, the IPU board compares the RAT cooling and RAT heating setpoints against the current RAT to determine if there is a demand for cooling or heating.

- In the Unocc mode, the IPU compares the unocc zone cooling and unocc zone heating setpoints against the current zone temperature to determine if there is a demand for cooling or heating.

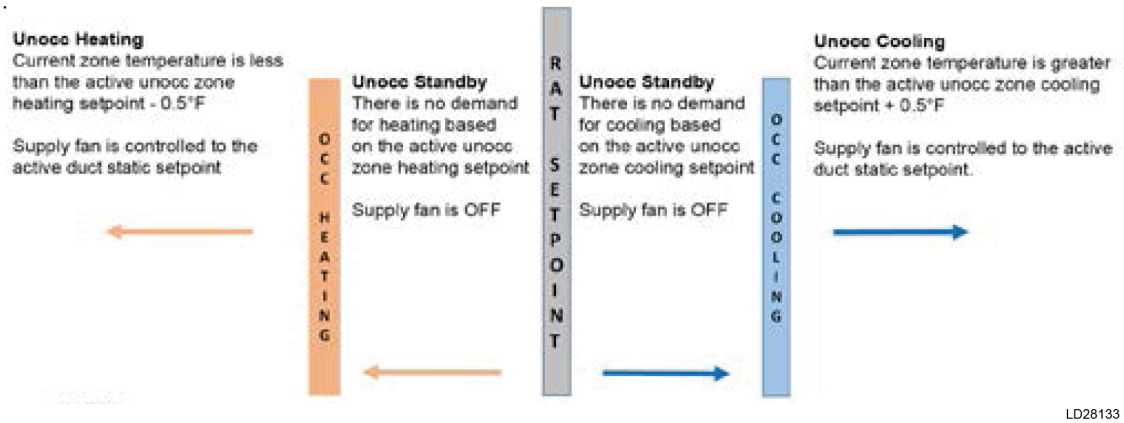
Figure 57: Flexsys-occupied



Note:

1. Whenever the unit enters an active cooling or heating mode, the IPU board utilizes as many or as few stages of cooling or heating that it needs to achieve and maintain the active mixed SAT setpoint.
2. Unit modes stage down when the zone temperature is 0.5°F under the setpoints for cooling and 0.5°F over the setpoints for heating.
3. Mixed SAT is a measurement of the supply air leaving the supply fan mixed with the air bypassed around the unit through the return air bypass. Evaporator leaving air temperature is the temperature of the air directly after leaving the evaporator coil (between the evaporator coil and the supply fan).
4. The supply fan runs continuously when in Flexsys Occ mode.

Figure 58: FlexSys — unoccupied



Note:

1. Whenever the unit enters an active cooling or heating mode, the IPU board utilizes as many or as few stages of cooling or heating that it needs to achieve and maintain the active mixed SAT setpoint.
2. Unit modes stage down when the zone temperature is 0.5°F under the setpoints for cooling and 0.5°F over the setpoints for heating.
3. In the Unocc mode, the supply fan is staged on or off with a cooling or heating demand.
4. Night setback must be user enabled for Unocc mode.

Fan operation

- The same as a VAV configured unit, the supply fan is controlled by a VFD.
- The VFD controls the speed of the supply fan up/down to achieve and maintain the active duct static setpoint.
- Due to the nature of a UFAD system, typical duct static setpoints may be much lower than a normal VAV system.
- The same as a VAV configured unit, the supply fan is on whenever the unit is in the Occ mode, and cycles ON/OFF in the Unocc mode with a demand for cooling or heating.

Cooling

- The sequence of operation for cooling on a FlexSys unit differs from a traditional VAV system.
- A FlexSys unit has two different Occ Cooling modes:
  - Occupied Cooling without Bypass
  - Occupied Cooling with Bypass
- The IPU board has internal logic it uses to determine which Occ Cooling mode to use.
- When a FlexSys unit enters an Active Occ Cooling mode, it always starts in Occ Cooling without Bypass for the first 30 seconds.
- After this 30 seconds has elapsed, the IPU board decides which Occ Cooling mode to be in.
- Unocc Cooling mode is the same as a VAV configured unit. The return air bypass damper remains closed.

Occupied cooling

Occ cooling without bypass

- When in the Occ cooling without bypass mode, the IPU board controls mechanical cooling or economizer operation to the active mixed SAT setpoint.
- When the economizer is active, the unit remains in the Occ cooling without bypass mode.
- When the current RAT is greater than the active RAT cooling setpoint plus 0.5°F but the current RAT is less than the mixed SAT setpoint plus the return air diff setpoint, the unit remains in the Occ Cooling without Bypass mode.
- When in Occ cooling without bypass, the return air bypass damper remains fully closed.

Occ cooling with bypass

- When in the Occ Cooling with Bypass mode, the IPU board controls mechanical cooling to the active evaporator air temperature (EAT) setpoint and the return air bypass damper is controlled to the active mixed SAT setpoint.
- When the current RAT is greater than the active RAT setpoint plus 0.5°F *and* the current RAT greater than the current mixed SAT setpoint plus the return air diff setpoint, then unit enters/remains in Occ Cooling with Bypass mode.
- For the most part, when mechanical cooling is operating on a FlexSys configured unit, the current operating mode is Occ Cooling with Bypass.

Active evaporator air temperature setpoint

- When in the Occ Cooling with Bypass mode, the IPU board stages compressors ON/OFF trying to achieve and maintain the active EAT setpoint.
- There are two different EAT setpoints the IPU board can choose from when in Occ Cooling with Bypass mode.

    a. EAT high setpoint: This setpoint is used when either of the following are true:

        - Return air humidity value is not valid.
        - Return air enthalpy is less than the reset enthalpy setpoint.

    b. EAT low setpoint: This setpoint is used when either of the following are true:

        - Return air enthalpy is greater than the reset enthalpy setpoint.
        - Underfloor slab dewpoint is greater than the underfloor slab temperature minus 2.0°F for 120 seconds (only applicable if dewpoint reset is user enabled).

Return air bypass damper

- A FlexSys configured unit must have a return air bypass duct and damper installed for proper operation.
- The return air bypass should be sized for no more than 40% of the total return air.
- YORK offers a specially designed curb for FlexSys configured units that incorporate the return air bypass duct and damper.
- The return air bypass damper allows warm return air to mix with the conditioned air leaving the evaporator coil.
- The operation of the bypass damper is very slow and the logic that drives the damper is quite complicated.
- When the unit is in normal operation, it could take up to 30 minutes for the bypass damper to go from 0 to 40%.
- If the unit is operating properly and the temperatures are in the proper range, the damper probably never drives to 40%.
- The IPU board opens or closes the bypass damper to temper the air leaving the evaporator coil trying to achieve and maintain the active mixed SAT setpoint.
- YORK engineers recommend the mixed SAT be approximately 62.0 to 64.0°F.

Unoccupied cooling

- Unocc Cooling operates the same as Unocc Cooling for a VAV configured unit.
- The return air bypass damper remains closed.
- Mechanical cooling and/or economizer operation is controlled to the active mixed SAT setpoint.

Table 38: Return air bypass damper

CURRENT %	The amount of air the IPU board calculates is bypassed because the mixed SAT is not increasing. The IPU board utilizes the current RAT, the current EAT, and the mixed SAT to perform a calculation to arrive at the current %.
ACTIVE SETPOINT %	How much the return air the IPU board calculates is needed to bypass to warm the mixed SAT from its current value to the mixed SAT setpoint. The IPU board utilizes the current RAT, current EAT, and current mixed SAT to perform a calculation to arrive at the active setpoint %.
BYPASS DAMPER POSITION	This is the actual position of the bypass damper. The bypass damper should be able to drive between 0% and 40%.
MAX BYPASS	This is the maximum amount of return air that the IPU board allows to bypass around the evaporator coil through the FlexSys bypass damper. The IPU board utilizes internal logic and calculations to determine how much of the return air is being bypassed. This is not the same as the actual bypass damper position. This is an adjustable setpoint with a range of 20–40%. We recommend leaving it at 40% for initial start-up and then adjusting down later if needed.

ⓘ **Note:** It is likely that the above mentioned parameters—return air bypass current %, return air bypass active setpoint %, and bypass damper position %—do not have matching values. This is normal; do not be alarmed.

Heating

- Occ and Unocc Heating operates the same as Occ and Unocc Heating for a VAV configured unit.
- It is recommended to limit the SAT heating setpoint between 80.0 to 90.0°F.
- Keeping the SAT heating setpoint between 80.0 to 90 .0°F keeps the underfloor slab from becoming too warm and then radiating heat for an extended period of time after heating operation has stopped.

Underfloor temperature control

- A FlexSys configured unit has two specialized sequences built in to help control the environment in the underfloor plenum:
    - Dew Point Reset
    - Active Slab Control
- Both of these sequences require an underfloor slab temperature sensor and an underfloor humidity sensor be installed.
- Both of these sensors are field provided/installed.

Dew point reset

- This sequence changes the active EAT setpoint from the EAT high setpoint to the EAT low setpoint when the temperature of the underfloor air approaches its dewpoint.

- The unit must have an underfloor slab temperature sensor and an underfloor humidity sensor installed for this sequence to function.
- dew point reset must be set to User Enabled in the PROGRAM-COOLING menu.

Sequence

- When the underfloor air dewpoint becomes greater than the underfloor slab temperature minus 2.0°F for 120 seconds, the IPU board switches the active EAT setpoint from the EAT high setpoint to the EAT low setpoint.
- The EAT low setpoint continues to be used as the active EAT setpoint until the underfloor air dewpoint becomes less than the underfloor slab temperature minus 2.5°F.

Active slab control

- This sequence allows heat to be turned ON during a transition from one occupancy state to another when the underfloor air temperature is higher than the underfloor slab temperature.
- The rooftop unit must have a heating source installed and set to User Enabled.
- Active Slab Control must be set to User Enabled in the PROGRAM-COOLING menu.
- The unit must have an underfloor slab temperature sensor installed for this sequence to function.

Sequence: Unoccupied to Occupied

- The IPU board checks the underfloor slab temperature immediately after switching from Unocc Standby to Occ Standby. If the unit transitions to Occ Cooling with or without bypass during this time, active slab control is terminated.
- When the underfloor slab temperature is less than the active mixed SAT setpoint minus 2.0°F, the underfloor temperature override becomes active.
- The IPU board activates the unit heating source and start a 20 minute active slab control timer.

    a. Staged gas or electric heat

        - The IPU board starts the first stage of heat.

    b. Modulating gas or hot water or steam heat

        - The IPU board controls the heating source to the active mixed SAT setpoint plus 10.0°F.

- Heating operation continues until either of the following are true:

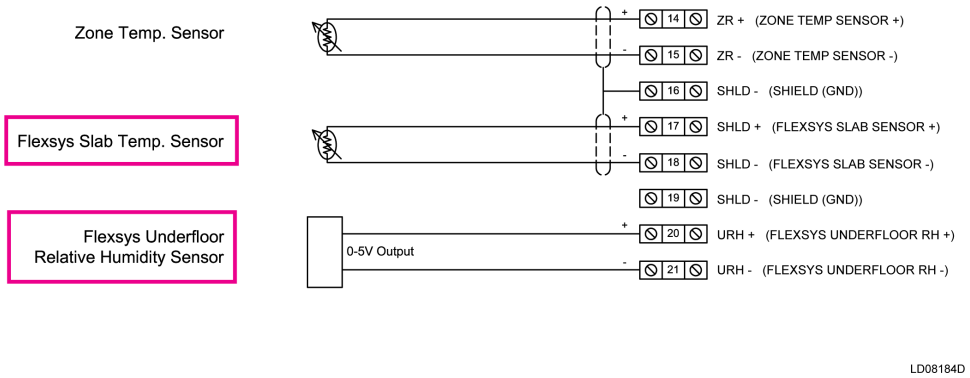
    - The underfloor slab temperature is greater than the active mixed SAT setpoint.
    - The 20 minute active slab control timer has expired.

Sequence: Occupied to Unoccupied

- The IPU board checks the underfloor slab temperature immediately after switching from an Occ to Unocc Standby mode.
- When the underfloor slab temperature is greater than the current RAT minus 2.0°F, the underfloor temp override becomes active.

- The IPU board activates the unit heating source and start a 20 minute active slab control timer.
    a. Staged gas or electric heat
        - The IPU starts the first stage of heat.
    b. Modulating gas or hot water or steam heat
        - The IPU board controls the heat to the active mixed SAT setpoint plus 10.0°F.
- Heating operation continues until either one of the following are true:
    - The underfloor slab temperature is greater than the current RAT plus 1.0°F.
    - The 20 minute active slab control timer has expired.

Figure 59: CTB1 field control wiring inputs



Smoke purge

- The rooftop units have three specialized smoke purge sequences.
- These three sequences are outside the normal operating sequences of the unit.
- They are typically only used in very specific applications, such as after a fire or smoke event.
- Smoke purge sequences can be initiated either by a hardwired input to CTB1 or through a command from the BAS.
- When the unit enters a Smoke Purge mode, all cooling and heating functions is immediately stopped.

Smoke purge setup

- Three different smoke purge sequences can be set:
    a. Smoke Purge 1
    b. Smoke Purge 2
    c. Smoke Purge 3
- Each of these different sequences can be set for one of three options:
    a. Purge
    b. Pressurization

c. Evacuation

- The different options for each sequence must be selected in the PROGRAM-UNIT DATA menu.

Smoke purge sequence of operation

Purge mode

This mode is used to purge the space with fresh air:

1. Start the supply fan.
2. Start the return fan (if applicable).
3. Start the exhaust fan (if applicable).
4. Open outside air dampers to 100% (if applicable).
5. Close return air dampers to 0% (if applicable).
6. Open exhaust dampers to 100% (if applicable).

Pressurization mode

This mode is used to pressurize the space in order to force the air inside the space through the walls to adjacent spaces or outside the building envelope:

1. Start the supply fan.
2. Start the return fan (if applicable).
3. Stop the exhaust fan (if applicable).
4. Open outside air dampers to 100% (if applicable).
5. Close the return air dampers to 0% (if applicable).

Evacuation mode

This mode is used to evacuate the space in order to draw air through the walls from adjacent spaces or outside the building envelope:

1. Stop the supply fan.
2. Start the return fan (if applicable).
3. Start the exhaust fan (if applicable).
4. Close outside air dampers to 0% (if applicable).
5. Open return air dampers to 100% (if applicable).
6. Open the exhaust dampers to 100% (if applicable).

User interface control center

User interface control center

The User Interface is used to commission, monitor, and troubleshoot the rooftop unit. It provides access to operational data, parameter programming, and access to history information that was recorded at the time of a unit or system fault.

The user interface is installed in the low voltage control compartment of the rooftop unit.

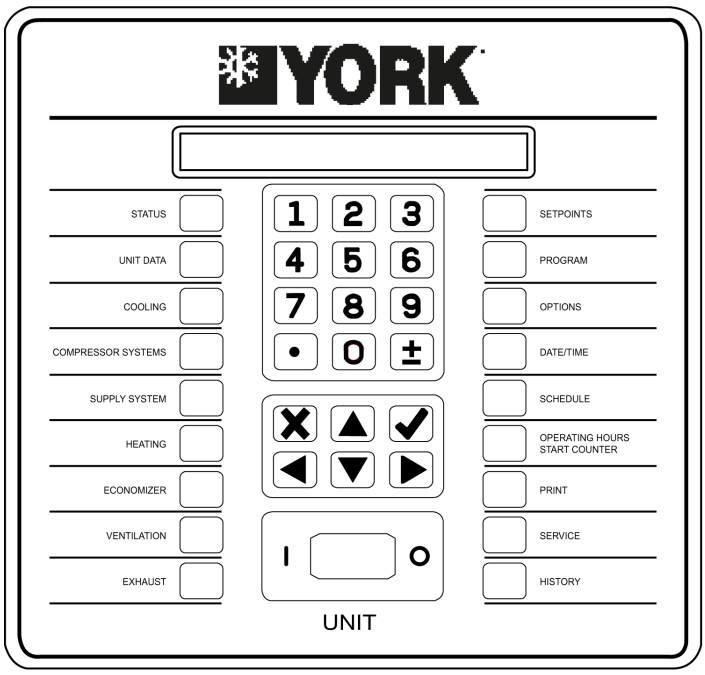
The user interface uses a flexible membrane style keypad and has an 80-character (2 lines of 40 characters) liquid crystal display. The display has a lighted background for night viewing and can be viewed in direct sunlight. The backlighting will energize when any button is pressed.

The keypad allows complete control of the system from a central location. The keypad offers a multitude of commands available to access displays, program parameters, and initiate system commands. The keypad consists of 36 keys, that are divided into three categories: Data Entry, Navigation, and Menu Selection keys. A description of each of the keys is contained below.

Data entry keys

The data entry keys provide a means to enter values for items that support edits. The keys available to support numeric input are the 0 through 9 keys, the decimal key, the +/- key, the **X** key and the √ key. The keys available to support choice input are the ◄ key, the ► key, the **X** key, and the √ key. Editing is started by pressing the ? key. ***Once editing has started, the user must press either the √ key or the X key***. Any other key press results in the **Press √ or X to Exit** message being displayed for two seconds. If you try to edit an item that is view only it is ignored by the menu system.

Figure 60: User interface control panel



LD010669

When a numeric value that can be modified is displayed, the Default, High, and Low prompt is shown in the upper right portion of the display. The cursor is shown at the digit to be changed. The cursor is shown after editing has started. After the desired numeric value has been entered, press the √ key to save the new value and exit the edit mode. Pressing the ◄ key will fill in the default

value. Edits will only be accepted when followed by pressing the √ key. Pressing the **X** key while in the edit mode will cancel the edit mode and leave the value unchanged. If an out of range value is entered, the Default, High and Low prompt is replaced by the Out of Range message for two seconds.

When a choice value that can be modified is displayed, the ◄ ► prompt is shown in the upper right portion of the display. The cursor is shown after editing has been started. The ◄ key or the ► key will allow the different choices to be viewed. When the desired choice is displayed, press the √ key to save the new value and exit the edit mode. Pressing the **X** key while in the edit mode will cancel the edit mode and leave the value unchanged.

Navigation keys

The navigation keys provide a means to browse items within a menu. The keys currently available to support navigation are the menu select keys, the ▲ key, the ▼ key, the ◄ key, and the ► key.

Pressing a menu select key brings the user to the first screen under that menu. The screens within each menu are arranged in a circular list. The user may browse through the screens using the ▲ key and the ▼ key. Pressing the ▼ key advances through the screens from top to bottom until the bottom screen has been reached. When the bottom screen is displayed, pressing the ▼ key wraps the display to the top screen of the menu. Pressing the ▲ key moves through the screens from bottom to top until the top screen has been reached. When top screen is displayed, pressing the ▲ key wraps the display to the bottom screen of the menu. Once either the ▲ key or the key ▼ is pressed, pressing any menu select key brings the user to the first screen under that menu (even if it is the same menu being viewed).

Navigation through the circular list of items can also be achieved by repeated presses of the same Menu Select key, as long as no other keys are pressed. For example, pressing the UNIT DATA key three times brings the user to the third screen of the UNIT DATA menu; pressing the UNIT DATA key once, then pressing the ▼ key, then pressing the UNIT DATA key again brings the user to the first screen of the UNIT DATA menu.

The ◄ key and the ► key are used to scroll sideways between the same displays for each system. For example, when viewing the Sys 1 Pressures under the COMPRESSOR SYSTEMS key, pressing the ► key scrolls sideways to the Sys 2 Pressures display and pressing the ◄ key scrolls sideways to the Sys Pressures display for the last system on the unit.

When programming numeric or non-numeric values, the ▼ key and the ▲ key are used to scroll forward (down) and backward (up) through the items to be programmed or set.

Menu select keys

The following menu keys are available on the User Interface: STATUS, UNIT DATA, COOLING, COMPRESSOR SYSTEMS (1, 2, or 3), SUPPLY SYSTEM, HEATING, ECONOMIZER, VENTILATION, EXHAUST, SETPOINTS, PROGRAM, OPTIONS, DATE/TIME, SCHEDULE, OPERATING HOURS / START COUNTER, PRINT, SERVICE, and HISTORY.

Each of the above menu keys gives access to a list of specific items contained in that menu. To minimize clutter, only the items applicable to the current unit configuration is displayed. Pressing any of the menu select keys at any time will send the user to the first item of the associated menu, provided the user is not editing an item in the current menu key item or the menu key is being used to navigate through a list of items.

Table 39 through Table 47 list the information that is contained under the STATUS, UNIT DATA, COOLING, COMPRESSOR SYSTEMS (1, 2, or 3), SUPPLY SYSTEM, HEATING, ECONOMIZER, VENTILATION, and EXHAUST menu selection keys of the User Interface. The tables contain the Displayed Text, Pass Word Level (if applicable), Range of Values (if applicable), Default Value (if applicable), what key (SETPOINTS, PROGRAM, OPTIONS) to use to change the value (if applicable), and under what circumstances the item is displayed.

Table 39: Status

Display text	Range	Default	Setting location	Shown when
Unit - overall status	Local Stop / Run / Unit Trip / Unit Fault / Unit Lockout / SMK Purge #-Press / SMK Purge #-Purge / SMK Purge #-Evac	Derived		Always
Current oper mode	Occ Standby / Occ Cooling Low / Occ Cooling High / Occ Heating Low / Occ Heating High / Unocc Standby / Unocc Cooling Low / Unocc Cooling High / Unocc Heating Low / Unocc Heating High / Morning Warm-Up / Comfort Vent Cooling / Comfort Vent Heating	Derived		Unit Type Equals CV
Current oper mode	Occupied Standby / Occupied Heating / Occupied Cooling / Unoccupied Standby / Unoccupied Heating / Unoccupied Cooling / Morning Warm-Up	Derived		Unit Type Equals VAV
Current oper mode	Occupied Standby / Occupied Heating / Occ Cooling Without Bypass / Occ Cooling With Bypass / Unoccupied Standby / Under Floor Temp Override	Derived		Unit Type Equals FLEXSYS
Supply sys statuS	Normal - Active / Normal Inactive / Safety Trip / Safety Fault / Safety Lockout	Derived		Always
Comp sys 1 status	Normal - Comp A On / Normal - Comp B On / Normal - Both On / Normal - Both Off / Safety Trip / Safety Fault / Safety Lockout / Low Amb Inhibit / Low Suct Temp Unl / High Dp Unload / User Disabled	Derived		Always
Comp sys 2 status	Normal - Comp A On / Normal - Comp B On / Normal - Both On / Normal - Both Off / Safety Trip / Safety Fault / Safety Lockout / Low Amb Inhibit / Low Suct Temp Unl / High Dp Unload / User Disabled	Derived		Always
Comp sys 3 status	Normal - Comp A On / Normal - Comp B On / Normal - Both On / Normal - Both Off / Safety Trip / Safety Fault / Safety Lockout / Low Amb Inhibit / Low Suct Temp Unl / High Dp Unload / User Disabled	Derived		Always
Heating sys status	Normal - Active / Normal - Inactive / Safety Trip / Safety Fault / Safety Lockout / User Disabled / None	Derived		Always
Econo sys status	Normal - Active / Normal - Inactive / Safety Trip / Safety Fault / Safety Lockout / User Disabled / None	Derived		Always
Vent sys status	Normal - Active / Normal - Inactive / Safety Trip / Safety Fault / Safety Lockout / User Disabled / None	Derived		Always
Exhaust sys status	Normal - Active / Normal - Inactive / Safety Trip / Safety Fault / Safety Lockout / User Disabled / None	Derived		Always
Sensor / misc status	Normal / Warning / Safety Trip / Safety Fault / Safety Lockout	Derived		Always
Filter status	Okay / Change	Derived		Always

Table 40: Unit data

Display text	Pass word level	Range	Default	Setting location	Show when unit type is:
Unit type	2	Constant Volume / Variable Air Volume / FlexSys / Single Zone VAV	Constant Volume	Options / Unit Data	Always
Unit size	2	70 Ton, 75 Ton, 80 Ton, 90 Ton, 105 Ton	50 Ton	Options / Unit Data	Always
Refrigerant type	2	R22 / R407c / R410a	R-22	Options / Unit Data	Always
Control method	1	Staged / Wired Zone Temp / Comm Zone Temp	Staged	Options / Unit Data	Unit Type Equals Constant Volume
SAT reset method	1	Hardwired, Outside Air, Return Air, Supply Fan Speed	Hardwired Input	Options / Unit Data	Unit Type Equals Variable Air Volum
Supply air temp					
Current		-20.0°FF To 180.0°F	Look Up Table		Unit Type E Equals Constant Volume Or Variable Air Volum
Active SP		50.0°F To 150.0°F	Derived		
MX supply air temp					
Current		-20.0°F To 180.0°F	Look Up Table		Unit Type E Equals FlexSys
Setpoint	1	50.0°F To 65.0°F	65.0°F	Setoints/ Unit Data	
Zone temp*					
Current		-20.0°F To 180.0°F	Look Up Table		Unit Type Equals Constant Volume Or Variable Air Volum
OCC ZONE COOLING SETPOINT	1	OCC Zone Heating Setpoint + 2.0°F	72.0°F	Setoints/ Unit Data	
Zone temp*					
Current		-20.0°F To 180.0°F	Look Up Table		Unit Type Equals Constant Volume Or Variable Air Volum
Unocc zone cooling setpoint	1	Unocc Zone Heating Setpoint + 2.0°F To 95.0°F	85.0°F	Setoints/ Unit Data	
Zone temp*					
Current		-20.0°F To 180.0°F	Look Up Table		Unit Type Equals Constant Volume Or Variable Air Volum
Occ zone heating Setpoint	1	60°F To OCC Zone Cooling Setpoint - 2.0°F	68.0°F	Setoints/ Unit Data	
Zone temp*					
Current		-20.0°F To 180.0°F	Look Up Table		Unit Type Equals Constant Volume Or Variable Air Volum
Unocc zone heating Setpoint	1	50.0°FF To Unocc Zone Cooling Setpoint - 2.0°F	60.0°F	Setoints/ Unit Data	
Smoke purge SEQ 1	1	Purge / Pressurization / Evacuation	Purge	Options / Unit Data	Always
Smoke purge SEQ 2	1	Purge / Pressurization / Evacuation	Pressurization	Options / Unit Data	Always

Table 40: Unit data

Display text	Pass word level	Range	Default	Setting location	Show when unit type is:
Smoke purge SEQ 3	1	Purge / Pressurization / Evacuation	Evacuation	Options / Unit Data	Always
Display language	1	English / Spanish	English	Options / Unit Data	Always
Display units	1	Imperial / Metric	Imperial		Always

Note: * Only the zone temp screen for the current active mode is shown.

Table 41: Cooling

Display text	Pass word level	Range	Default	Setting location	Show when unit type is
Supply air temp					
Current		-20.0°F To 180.0°F	Look Up Table		Unit Type Equals Constant Volume Or Variable Air Volum
Active SP		50.0°F To 150.0°F	Derived		
Flex evap temp					
Current		-20.0°F To 180.0°F	Look Up Table		Unit Type Equals FLEXSYS And Current Oper Mode Is OCC Cooling w/ byp
Active SP		50.0°F To 60.0°F	Derived		
MX supply air temp					
Current		-20.0°F To 180.0°F	Look Up Table		Unit Type Equals FLEXSYS
Setpoint	1	50.0°F To 75.0°F	65.0°F	Setpoints/Cooling	
Cooling control offset		1.0°F To 100.0°F	Derived		
Return air diff SP	2	2.0°F To 10.0°F	6.0°F	Setpoints/Cooling	Unit Type Equals FLEXSYS
Zone temp*					
Current		-20.0°F To 180.0°F	Look Up Table		Unit Type Equals Constant Volume Or Variable Air Volum
Occ zone cooling Setpoint	1	OCC Zone Heating + 2.0°F To 85.0°F	72.0°F	Setpoints/Cooling	
Zone temp*					
Current		-20.0°F To 180.0°F	Look Up Table		Unit Type Equals Constant Volume Or Variable Air Volum
Unocc zone cooling Setpoint	1	UNOCC Zone Heating + 2.0°F To 95.0°F	85.0°F	Setpoints/Cooling	
Return air temp					
Current		-20.0°F To 180.0°F	Look Up Table		Unit Type Equals Variable Air Volum Or FLEXSYS
RAT cooling setpoint	1	RAT Heating Setp +2.0°F To RAT For High Sat	70.0°F	Setpoints/Cooling	
Return air bypass					
Current		0–100%	Derived		Unit type equals FLEXSYS
Active SP		0–100%	Derived		
Bypass damper position		0–100%	Derived		Unit type equals FLEXSYS
Underfloor air					
Temp		-20.0°F To 180.0°F	Look Up Table		Unit type equals FLEXSYS and dewpoint reset equals enabled
Humidity		0–100%	Derived		

Table 41: Cooling

Display text	Pass word level	Range	Default	Setting location	Show when unit type is
Underfloor slab					
Temp		-20.0°F To 180.0°F	Look Up Table		Unit type equals FLEXSYS and dewpoint reset equals enabled
Dew point		30.0°F To 100.0°F	Derived		
Maximum bypass	1	20–40%	40%	Setpoints/Cooling	Unit type equals FLEXSYS
Dew point reset	1	User Enabled User Disabled	User Disabled	Program/Cooling	Unit type equals FLEXSYS
Under flr temp ovrd	1	Active - Inactive	Derived		Unit type equals FLEXSYS
Active slab control	1	User Enabled User Disabled	User Disabled	Program/Cooling	Unit Type Equals FLEXSYS
1st stage cooling setpoint	1	55.0°F To 60.0°F	60.0°F	Setpoints/Cooling	Unit Type Equals Constant Volume
2nd stage cooling setpoint	1	55.0°F To 60.0°F	55.0°F	Setpoints/Cooling	Unit Type Equals Constant Volume
SAT low setpoint	1	55.0°F To 60.0°F	55.0°F	Setpoints/Cooling	Unit Type Equals Variable Air Volum
SAT HIGH SETPOINT	1	55.0°F To 60.0°F	65.0°F	Setpoints/Cooling	Unit Type Equals Variable Air Volum
OAT setpoint for					
Low SAT	1	OAT Setpoint For High Sat To 90.0°F	80.0°F	Setpoints/Cooling	Unit Type Equals Variable Air Volum And Sat Reset Method Equals Outside Temp
High SAT	1	60.0°F To OAT Setpoint For Low Sat	70.0°F	Setpoints/Cooling	Unit Type Equals Variable Air Volum And Sat Reset Method Equals Outside Temp
RAT setpoint for					
Low SAT	1	RAT Setpoint For High RAT +5.0°F To 90.0°F	90.0°F	Setpoints/Cooling	Unit Type Equals Variable Air Volum And Sat Reset Method Equals Return Temp
High SAT	1	RAT Cooling Setpoint To RAT Setpoint For Low Sat -5.0°F	80.0°F	Setpoints/Cooling	Unit Type Equals Variable Air Volum And Sat Reset Method Equals Return Temp
Fan speed setp for					
Low SAT	1	Fan Speed Setp For High Sat To 100%	90%	Setpoints/Cooling	Unit Type Equals Variable Air Volum And Sat Reset Method Equals Supply Fan Speed
High SAT	1	50% To Fan Speed Setp For Low Sat	70%	Setpoints/Cooling	Unit Type Equals Variable Air Volum And Sat Reset Method Equals Supply Fan Speed

Table 41: Cooling

Display text	Pass word level	Range	Default	Setting location	Show when unit type is
Evap leaving air temp high	1	50.0°F To 60.0°F	60.0°F	Setpoints/Cooling	Unit Type Equals FLEXSYS
Evap leaving air temp low	1	50.0°F To 60.0°F	50.0°F	Setpoints/Cooling	Unit Type Equals FLEXSYS
Reset enthalpy SP	2	25 To 35 BTU	30 Btu/#	Setpoints/Cooling	Unit Type Equals FLEXSYS
SUP air tempering	2	User Enabled User Disabled	User Disable	Program/Cooling	Unit Type Equals Variable Air Volum Or FLEXSYS
Mech clg lockout temp	1	0.0°F To 65.0°F	50.0°F	Setpoints/Cooling	Press Trans Pkg And Low Ambient Pkg Other Than None
Mech clg lockout tmp minimum	2	-10.0°F To 0.0°F	0.0°F	Setpoints/Cooling	Press Trans Pkg And Low Ambient Pkg Other Than None

ⓘ **Note:** * Only the zone temp screen for the current active mode is shown.

Table 42: Compressor systems (1, 2, or 3)

Display text	Pass word level	Range	Default	Setting location	Show when unit type is
Comp sys*status		Normal - Comp A On / Normal - Comp B On / Normal - Both On / Normal - Both Off / Safety Trip / Safety Fault / Safety Lockout / Low Amb Inhibit / Low Suct Temp Unl / High Dp Unload / User Disabled	Derived		Always
Comp sys* state	1	Stop / Run / Lockout / Auto Reset	Derived	Options / Comp Sys	Always
Condenser fan 1A / 1		Off / On	Derived		
Condenser fan 1B / 2		Off / On	Derived		
Condenser fan 2A / 3		Off / On	Derived		
Condenser fan 2B / 4		Off / On	Derived		
Condenser fan 3A / 5		Off / On	Derived		Always
Condenser fan 3B / 6		Off / On	Derived		Always
Safety input					
LPCO		Okay - Faulted	Derived		Always
Chain		Okay - Faulted	Derived		
Suction temp		-20.0°F To 180.0°F	Look Up Table		Press Trans Pkg Indicates That Transducers Are Not Installed For The Applicable System
Pressure					

Table 42: Compressor systems (1, 2, or 3)

Display text	Pass word level	Range	Default	Setting location	Show when unit type is
Discharge *		-0 to 320 PSIG	Look Up Table		Press Trans Pkg Indicates That Transducers Are Installed For The Applicable System
Suction*		0–800 PSIG	Look Up Table		
Temperature					
Suction	1	-20.0°F To 180.0°F	Look Up Table		Press Trans Pkg Indicates That Transducers Are Installed For The Applicable System
Superheat		0.0°F To 50.0°F	Derived		
Current run time					
Comp A		HH:MM:SS	Derived		Always
Comp B		HH:MM:SS	Derived		
Pumpdown	2	User Enabled User Disabled	Disabled	Program/Comp Sys.	Always
Ready to run					
Comp A		Yes - No	Derived		Always
Comp B		Yes - No	Derived		
Ready to stop					
Comp A		Yes - No	Derived		Always
Comp B		Yes - No	Derived		
System unloading pressure	2	250–450 PSIG	400 PSIG	Setpoints/Comp Sys	Press Trans Pkg Does Not Equal None
Press trans pkg	2	None / Sys 1 / Sys 1, 2 / Sys 1, 2, 3	None	Optional/Comp Sys	Always
Low ambient pkg	2	None / Sys 1 / Sys 1, 2 / Sys 1, 2, 3	None	Optional/Comp Sys	Always

ⓘ **Note:** * May be 1, 2, or 3

Table 43: Supply system

Display text	Pass word level	Range	Default	Setting location	Show when unit type is
Supply sys status		Normal - Active Normal - Inactive Safety Trip Safety Fault Safety Lockout			Always
Supply fan					
Output		On - Off	Derived		Always
Status		Running Stopped	Derived		
Supply fan VFD speed		0–100%	Derived		Unit Type Equals Variable Air Volum Or FLEXSYS
Single zone VAV min VFD speed		33–66%	50%		Unit Type equals Single Zone VAV
Duct static press					
Current		0.00–5.00 iwg	Look Up Table		Unit Type Equals Variable Air Volum Or FLEXSYS
Active SP		0.00 To 5.00 iwg	Derived		
Return fan					

Table 43: Supply system

Display text	Pass word level	Range	Default	Setting location	Show when unit type is
Output		On - Off	Derived		Power Exhaust Type Equals Return W/ Exhaust + Return W/O Exhaust Fans
Status		Running Stopped	Derived		
Exhaust / return fan VFD		0–100%	Derived		Power Exhaust Type Equals Return W/ Exhaust + Return W/O Exhaust Fans
Return fan press					
Current		-1.00 To +1.00 iwg	Look Up Table		Power Exhaust Type Equals Return W/ Exhaust + Return W/O Exhaust Fans
Active SP		0.00–1.00 iwg	Derived		
Duct press transducer span	2	1.25, 2.5, 5.0	5.0	Setpoints / Supply System	Unit Type Equals Variable Air Volum Or FLEXSYS
Duct static reset low setp	1	0–1 iwg - Span 0 iwg To Duct Static Reset High	1.5 In-Wg	Setpoints / Supply System	Unit Type Equals Variable Air Volum Or FLEXSYS
Duct static reset high setp	1	Duct Static Reset Low Limit To Span	2.5 In-Wg	Setpoints / Supply System	Unit Type Equals Variable Air Volum Or FLEXSYS
Duct static over pressure	2	0 - I iwg - 5 In-Wg	3.0 In-Wg	Setpoints / Supply System	Unit Type Equals Variable Air Volum Or FLEXSYS
Return pressure high setp	2	0.15–0.45	0.15	Setpoints / Supply System	Power Exhaust Equals Return W/Exhaust

Table 44: Heating

Display text	Pass word level	Range	Default	Setting location	Show when unit type is
Heating sys status		Normal - Active / Normal - Inactive / Faulted / User Disabled / Under Floor Control / None	Derived		Always
Heating system type	2	None / Electric/ Staged Gas/ Modulating Gas/ Hot Water/ Steam	None	Options / Heating	Always
Gas heat capacity	2	375 Mbh / 750 Mbh / 1125 Mbh	375 Mbh	Options / Heating	Heat Type Equals Staged Gas Or Modulating Gas
Elec heat capacity	2	40 Kw - 200V 40 Kw / 80 Kw / 80 Kw - 200V/ 100 Kw - 200V/ 100 Kw / 120 Kw/ 160 Kw / 200 Kw / 240 Kw	40 Kw	Options / Heating	Heat Type Equals Electric
Supply air temp					

Table 44: Heating

Display text	Pass word level	Range	Default	Setting location	Show when unit type is
Current		-20.0°F To 180.0°F	Look Up Table		Heat Type Does Not Equal None
Active SP		50.0°F To 120.0°F	Derived		
Zone temp*					
Current		-20.0°F To 180.0°F	Look Up Table		Always
Occ zone heating Setpoint	1	60.0°F To Occ Zone Cooling Setpoint -2.0°F	68.0°F	Setpoints / Heating	
Zone temp*					
Current		-20.0°F To 180.0°F	Look Up Table		Always
Unocc zone heating Setpoint	1	50.0°F To Unocc Zone Cooling Setpoint -2.0°F	60.0°F	Setpoints / Heating	
Return air temp					
Current		-20.0°F To 180.0°F	Look Up Table		Heat Type Does Not Equal None And Unit Equals Variable Air Volum Or FLEXSYS
RAT heating setpoint	1	55.0°F - RAT Cooling Setpoint -2.0°F	68.0°F	Setpoints / Heating	
Heat entering temp		-20.0°F To 180.0°F	Look Up Table		Heat Type Equals Staged Gas
Staged heat status					
Stgs on		0 To 6	Derived		Heat Type Equals Electric Or Staged Gas
Stgs aval		2 To 6	Derived		
Hw / steam					
Valve pos		0–100%	Derived		Heat Type Equals Hot Water Heat Steam
Frz stat		Ok Tripped	Derived		
Heating control offset		1.0°F To 100.0°F	Derived		
Mod furnace output					
Relative		0–100%	Derived		Heat Type Equals Modulating Gas
Aprx rate		37.5–900.0 Mbh	Derived		
Furnace 1A mode		Off / Purge / Ignition / On - Low / On - High / Safety Trip / Safety Fault / Safety Lockout / Fault - L/O	Derived		Heating Type Equals Modulating Gas
Furnace 1A mode					
Relative		0–100%	Derived		Heat Type Equals Modulating Gas
Aprx rate		37.5–150.0 Mbh	Derived		
Furnace 1B mode		Off / Purge / Ignition / On / Safety Trip / Safety Fault / Safety Lockout / Fault -L/O	Derived		Heat Type Equals Modulating Gas

Table 44: Heating

Display text	Pass word level	Range	Default	Setting location	Show when unit type is
Furnace 1 mode		Off / Purge / Ignition / On-Low / On - High / Safety Trip / Safety Fault / Safety Lockout / Fault -L/O	Derived		Heat Type Equals Staged Gas
Furnace 2 mode		Off / Purge / Ignition / On - Low / On - High / Safety Trip / Safety Fault / Safety Lockout / Fault -L/O	Derived		Gas Heat Size Equals 750 MBH Or 1125 MBH
Furnace 3 mode		Off / Purge / Ignition / On - Low / On -High / Safety Trip / Safety Fault / Safety Lockout / Fault -L/O	Derived		Gas Heat Size Equals 1125 MBH
Heating system	1	User Enabled User Disabled	User Enabled	Program / Heating	Heat Type Does Not Equal None
Morning warm up	1	User Enabled User Disabled	User Disabled	Program / Heating	Heat Type Does Not Equal None And Constant Volume Control Method Does Not Equal Staged
Adapt morn warm up	1	User Enabled User Disabled	User Disabled	Program / Heating	Heat Type Does Not Equal None And Constant Volume Control Method Does Not Equal Staged
Night set back	1	User Enabled User Disabled	User Disabled	Program / Heating	Heat Type Does Not Equal None
Heat limit temperature	2	100.0°F to 150.0°F	130.0°F	Setpoints / Heating	Heat Type Does Not Equal None
Heating SAT	1	80.0°F to 115.0°F	100.0°F	Setpoints / Heating	Heat Type Does Not Equal None, Unit Type Equals Variable Air Volum, FlexSys
Hw valve action	2	Direct - Reverse	Direct	Program / Heating	Heating Type Equals Hot Water Steam
1st stage heating setpoint	1	80.0°F to 95.0°F	85.0°F	Setpoints / Heating	Heat Type Does Not Equal None And Unit Type Equals Constant Volume

Table 44: Heating

Display text	Pass word level	Range	Default	Setting location	Show when unit type is
2nd stage heating setpoint	1	95.0°F to 115.0°F	100.0°F	Setpoints / Heating	Heat Type Does Not Equal None And Unit Type Equals Constant Volume
Daily warm up time day 1		0 Min. To Morning Warm Up Max Time	Derived		Heat Type Does Not Equal None And Morn Warm Up Equals Enabled
Daily warm up time day 2		0 Min. To Morning Warm Up Max Time	Derived		Heat Type Does Not Equal None And Morn Warm Up Equals Enabled
Daily warm up time day 3		0 Min. To Morning Warm Up Max Time	Derived		Heat Type Does Not Equal None And Morn Warm Up Equals Enabled
Daily warm up timer		0 Min. To Morning Warm Up Max Time	Derived		Heat Type Does Not Equal None And Morn Warm Up Equals Enabled
Morning warm up opt time		0 Min. To Morning Warm Up Max Time	Derived		Heat Type Does Not Equal None And Morn Warm Up Equals Enabled
Morning warm up max time	1	15–240 Min.	120 Min.	Setpoints/Heating	Heat Type Does Not Equal None And Morn Warm Up Equals Enabled

ⓘ **Note:** * Only the zone temp screen for the current active mode is shown.

Table 45: Economizer

Display text	Pass word level	Range	Default	Setting location	Show when unit type is
Econo sys status		Normal - Active / Normal - Inactive / Faulted / User Disabled / None	Derived		Always
Econo installed	2	None / Drybulb / Single Enthalpy / Dual Enthalpy	None	Options / Economizer	Always
Econo method to use	1	Dry Bulb / Single Enthalpy / Dual Enthalpy / Best Available	Best Available	Options / Economizer	Economizer Installed Does Not Equal None
Econo method active		Dry Bulb / Single Enthalpy / Dual Enthalpy	Derived		Economizer Installed Does Not Equal None
Economizer control output		0 To 100%	Derived		Economizer Installed Does Not Equal None
Outside air temp		-20.0°F To 180.0°F	Look Up Table		Economizer Installed Does Not Equal None
Outside air					

Table 45: Economizer

Display text	Pass word level	Range	Default	Setting location	Show when unit type is
Humidity		0–100%	Look Up Table		Economizer Installed Equals Single Enthalpy Or Dual Enthalpy
Enthalpy		7.2–204.9 BTU/LB	Look Up Table		Economizer Installed Equals Single Enthalpy Or Dual Enthalpy
Return air temp		-20.0°F To 180.0°F	Look Up Table		Economizer Installed Equals Dual Enthalpy
Return air					
Humidity		0–100%	Look Up Table		Economizer Installed Equals Dual Enthalpy
Enthalphy		7.2–204.9 BTU/LB	Look Up Table		Economizer Installed Equals Dual Enthalpy
Outside air enthalpy setpoint	1	22.0–40.0 BTU/LB	28.0 BTU/LB	Setpoints / Economizer	Economizer Installed Does Not Equal None
Economizer system	1	User Enabled User Disabled	Disabled	Program / Economizer	Economizer Installed Does Not Equal None

Table 46: Ventilation

Display text	Pass word level	Range	Default	Setting location	Show when unit type is
Vent sys status		Normal - Active/ Normal - Inactive / Faulted / User Disabled / None	Derived		Always
Damper hardware	2	None / 2 Position/ Standard/ Tek Air Full IAQ	Standard Dampers	Options / Ventilation	Always
Ventilation control	1	Fixed Minimum / Demand	Fixed Minimum	Options / Ventilation	Damper Hardware Does Not Equal None Or 2 Position
OA damper position					
Current		0–100%	Derived		Damper Hardware Does Not Equal None
Active SP		0–100%	Derived		
Ventilation demand		0–100%	Derived		Ventilation Control Equals Demand
CO_2 level					
Outside		0–2000 PPM	Look Up Table		Ventilation Control Equals Demand
Inside		0–2000 PPM	Look Up Table		
CO_2 offset					
Current		± 0–2000 PPM	Derived		Ventilation Control Equals Demand
Setpoint	1	100–1000 PPM	500 PPM	Setpoints / Ventilation	
OA damper minimum position	1	0 to OA Damper Maximum Position	15%	Setpoints / Ventilation	Damper Hardware Does Not Equal None Or 2 Position Damper
OA damper maximum position	1	OA Damper Minimum Position To 100%	30%	Setpoints / Ventilation	Damper Hardware Does Not Equal None Or 2 Position Damper

Table 46: Ventilation

Display text	Pass word level	Range	Default	Setting location	Show when unit type is
Continuous vent	1	User Enabled User Disabled	User Enabled	Program / Ventilation	Unit Type Equals Constant Volume
Comfort ventilation	1	User Enabled User Disabled	User Disabled	Program / Ventilation	Unit Type Equals Constant Volume
Outside air minimum flow	1	Minimum - Derived Span X 5% Maximum - The Lower Of Derived Span X 50% And Outside Air Maximum Flow	Derived Span X 15%	Setpoints / Ventilation	Damper Hardware Tek-Air Control Set To Demand
Outside air maximum flow	1	Minimum - Outside Air Minimum Flow Maximum - Derived Flow	Derived Span X 30%	Setpoints / Ventilation	Damper Hardware Tek-Air Control Set To Demand
Minimum OA flow setpoint	1	0–100%	Derived Span X 15%	Setpoints / Ventilation	Damper Hardware Tek-Air And Ventilation Control Set To Fixed Minimum
Ventilation system	1	User Enabled User Disabled	User Enabled	Program / Ventilation	Damper Hardware Does Not Equal None

Table 47: Exhaust

Display text	Password level	Range	Default	Setting location	Show when unit type is
Exhaust sys status		Normal - Active / Normal - Inactive / Faulted / User Disabled / None	Derived		Always
Power exhaust type	2	None / On-Off Damper Ctrl / On-Off Press Cntrl / Modulate Damper - VFD / Return Fan W/ Exh / Return Fan W/O Exh	Setting	Options / Exhaust	Always
Building pressure					
Current		-0.50 To 0.50 iwg	Look Up Table		Power Exhaust Does Not Equal None Or On-Off Damper Ctrl
Active setpoint	1	-0.15 - +0.15 iwg	0.00" W.C.	Setpoints / Exhaust	
Exhaust fan					
Output		On - Off	Derived		Power Exhaust Equals On Off Dampers Ctrl, On-Off Press Cntrl, Modulate Damper - VFD Fan
Status		Stopped / Running	Derived		
Exhaust damper position		0–100%	Derived		Power Exhaust Equals Modulate Damper - VFD, Or Return Fan W/ Exh

Table 47: Exhaust

Display text	Password level	Range	Default	Setting location	Show when unit type is
Exhaust / return fan VFD		0–100%	Derived		Power Exhaust Equals Modulate Damper - VFD
Bldg pressure cntrl offset	1	- 0.15 To +0.15 iwg	0.00" W.C.	Setpoints / Exhaust	Power Exhaust Equals On - Off Press Ctrl
Econo output for fan start	1	Econo Output For Fan Stop To 100%	10 %	Setpoints / Exhaust	Power Exhaust Equals On - Off Dmpr Ctrl
Econo output for fan stop	1	0 To Econo Output For Fan Start	5%	Setpoints / Exhaust	Power Exhaust Equals On - Off Dmpr Ctrl
Exhaust output for fan start	1	Exhaust Output For Fan Stop To 100%	10%	Setpoints / Exhaust	Power Exhaust Equals Modulate Damper - VFD
Exhaust output for fan stop	1	0 To Exhaust Output For Fan Start	5%	Setpoints / Exhaust	Power Exhaust Equals Modulate Damper - VFD

Setpoints

All SETPOINTS values are numeric. Setpoints parameters can be viewed under their respective menu select key on the left side of the keypad. However, they can only be changed under the SETPOINTS key using the following procedure.

Press the SETPOINTS key to enter the menu. The Enter Password screen appears. All setpoints parameters require the use of a password before they can be changed. See the Password for information on how to enter a password into the UI. When a Level 1 password is entered, only Level 1 setpoints are available to change. Entering a Level 2 password makes all setpoints available.

After the password is accepted, use the ◄ key or the ► key to select the menu subsection that contains the parameter you would like to change: Unit, Cooling, Compressor Systems, Supply System, Heating, Economizer, Ventilation, or Exhaust. The setpoints contained under each of these menu subsections and their password level are contained in Table 39 through Table 47. Use the ▼ key and the ▲ key to navigate to the parameter to change. Follow the instructions given in Data entry keys to change the value.

Program

All PROGRAM information is User Enabled/User Disabled values. Program parameters can be viewed under their respective menu select key on the left side of the keypad. However, they can only be changed under the PROGRAM key using the following procedure.

Press the PROGRAM key to enter the menu. The Enter Password screen appears. All program parameters require the use of a password before they can be changed. See the Password for information on how to enter a password into the UI. When a Level 1 password is entered, only Level 1 program information is available to change. Entering a Level 2 password makes all program information available.

After the password is accepted, use the ◄ key or the ► key to select the menu subsection that contains the parameter to change: Unit, Cooling, Compressor Systems, Supply System, Heating, Economizer, Ventilation, or Exhaust. The parameters contained under each of these menu subsections and their password level are contained in Table 39 through Table 47. Use the ▼ key and the ▲ key to navigate to the parameter to change. Follow the instructions given in the section Data entry keys to change the parameter to the desired value.

Options

All OPTIONS information is selected from the listed parameter data. Options parameters can be viewed under their respective menu select key on the left side of the keypad. However, they can only be changed under the OPTIONS key using the following procedure.

Press the OPTIONS key to enter the menu. The Enter Password screen appears. All options parameters require the use of a password before they can be changed. See the Password for information on how to enter a password into the UI. When a Level 1 password is entered, only Level 1 options information is available to change. Entering a Level 2 password makes all options information available.

After the password is accepted, use the ◄ key or the ► key to select the menu subsection that contains the parameter to change: Unit, Cooling, Compressor Systems, Supply System, Heating, Economizer, Ventilation, or Exhaust. The parameters contained under each of these menu subsections and their password level are contained in Table 39 through Table 47. Use the ▼ key and the ▲ key to navigate to the parameter to change. Follow the instructions given in the section Data entry keys to change the parameter to the desired value.

Date / time

To change the day, time, and date, press the DATE/TIME key. The ▼ key is used to scroll to the next item to be programmed and the ▲ key scrolls to the previous item. The following messages are displayed. The first line is an active display and the second line is the entry line.

Clock Fri 18 Jun 2004 10:15:33 am	
Day of month	=XX

Clock Fri 18 Jun 2004 10:15:33 am	
Month	=XX

Clock Fri 18 Jun 2004 10:15:33 am	
Year	=XXXX

Clock Fri 18 Jun 2004 10:15:33 am	
Hour	=XX

Clock Fri 18 Jun 2004 10:15:33 am	
Minute	=XX

Clock Fri 18 Jun 2004 10:15:33 am	
Day of week	=XXX

Clock Fri 18 Jun 2004 10:15:33 am	
12 hour period	=XX

Clock Fri 18 Jun 2004 10:15:33 am	
TIME FORMAT	=XXXXXXX

Clock Fri 18 Jun 2004 10:15:33 am	
Power off time	=XXXXX

Follow the instructions given in the section Data entry keys to change the above values.

Schedule

The clock schedule function can be User Enabled / User Disabled by using the SCHEDULE screens below.

To set the schedule, press the SCHEDULE key. The display shows the following messages:

SCHEDULE √ TO EDIT OCCUPANCY SCHEDULE USER ENABLED
SCHEDULE MON √ TO EDIT +START =06:00 AM STOP =10:00 PM
SCHEDULE TUE √ TO EDIT START =06:00 AM STOP =10:00 PM
SCHEDULE WED √ TO EDIT START =06:00 AM STOP =10:00 PM
SCHEDULE THU √ TO EDIT START =06:00 AM STOP =10:00 PM
SCHEDULE FRI √ TO EDIT START =06:00 AM STOP =10:00 PM
SCHEDULE SAT √ TO EDIT START =06:00 AM STOP =10:00 PM
SCHEDULE SUN √ TO EDIT START =06:00 AM STOP =10:00 PM

SCHEDULE THU ? TO EDIT START =06:00 AM STOP =10:00 PM

To change the start or stop time, press the √ key. The line under the 0 is the cursor. If the start time is wrong, it can be changed from the numeric keypad. Once the correct value (hour and minute) is entered, press the √ key. The cursor then moves to the AM/PM selection. This value can be chosen by the ± key and entered by pressing the √ key. This process can be followed until the hour, minutes, and meridian of both the start and stop points are set.

Press the ▼ key to get the schedule for the next day to appear. The start and stop time of each day may be programmed differently. To view the schedule without making a change, simply press the ▼ key until the day you wish to view appears. The ▲ key scrolls backwards to the previous screen.

After the SUN (Sunday) schedule appears on the display, a subsequent press of the ▼ key displays the holiday schedule. This is a two-part display. The times may be set using the same procedure as described above for the days of the week.

SCHEDULE	HOL
START =06:00 AM STOP =10:00 PM	

Continue pressing the ▼ key to set the 15 holiday dates. The display will read:

SCHEDULE	MMD
HOLIDAY 01	=1225

The month and the day of each holiday are entered in this MMDD format. Enter 0000 to not specify a holiday. The MMDD is displayed when the value is being edited to remind the operator what the format of this number is (for example, 1225 represents December 25).

The line below the empty space is the cursor and moves to the next or previous empty space when the ◄ key or the ► key is pressed. To set the holiday, the cursor is moved to the space following the day of the week of the holiday and the ± key is pressed. An * appears in the space signifying that day as a holiday. The holiday schedule must be programmed weekly. When there is no holiday, the ± key is used to delete the *. The √ key is used to accept the holiday schedule for the next seven days.

Operating hours and start counter

Compressor operating hours and compressor starts, supply fan operating hours and supply fan starts, exhaust fan operating hours and exhaust fan starts, and return fan operating hours and return fan starts are displayed via the OPERATING HOURS/START COUNTER key. The maximum value for both hours and starts is 99,999, at which point they roll over to 0. See Table 48 for the displays.

Below shows a typical screen example:

HOURS / STARTS OPER HRS. XXXXX COMPRESSOR 1A STARTS XXXXX

Table 48: Operating hours / start counter

Display text	Pass word level	Range	Default	Setting location	Show when
Compressor 1A oper hrs **Compressor 1A starts**	1		Derived		
Compressor 1B oper hrs **Compressor 1B starts**	1		Derived		
Compressor 2A oper hrs **Compressor 2A starts**	1		Derived		
Compressor 2B oper hrs **Compressor 2B starts**	1		Derived		
Compressor 3A oper hrs **Compressor 3A starts**	1		Derived		Number Of Comps 6. Unit Capacity Equals 70 Ton, 75 Ton, 80 Ton, 90 Ton, 105 Ton
Compressor 3B oper hrs **Compressor 3B starts**	1		Derived		
Condenser fan 1A					
Condenser fan 1B					
Condenser fan 2A					
Condenser fan 2B					

Table 48: Operating hours / start counter

Condenser fan 3A					Number Of Comps 6. Unit Capacity Equals 70 Ton, 75 Ton, 80 Ton, 85 Ton, 90 Ton, 95 Ton, 105 Ton, 106 Ton, 110 Ton, 115 Ton, 130 Ton, 150 Ton.
Condenser fan 3B					
Exhaust fan oper hrs **Exhaust fan starts**	1		Derived		Power Exhaust On/Off Dmpr / On/Off Press / Modulate Damper - VFD.
Supply fan oper hrs **Supply fan starts**	1		Derived		
Return fan oper hrs **Return fan starts**	1		Derived		Supply System Type Equals Return Fan W/Exh Return W/O Exhaust.

Printer

The IPU board has the capability of being connected though the RS-232 serial port, Port 2, to a computer using Hyper Terminal. A NUL MODEM cable must be used to connect the computer to the IPU board.

Setup

The computer must be connected to Port 2 of the IPU board. Use the SERVICE key to verify that Port 2 is configured to TERMINAL.

Press the PRINT key on the keypad. Use the down arrow key to set the following:

- PRINTER BAUD RATE
- PRINTER PARITY
- PRINTER STOP BITS
- PRINTER ROWS PER PAGE

These parameters must be set identical to the settings in Hyper Terminal. In addition, the data bits must be set to 8, and the Flow Control must be set to NONE.

To use Hyper Terminal to save a report to a file:

- Select Transfer – Transfer Text and enter a file name to save the report in.
- On the UI, select the report you want to print. See Report section to select the report.
- As the report is uploading from the IPU board to the PC, it is displayed in the Hyper Terminal window.
- When the reports finish transferring to the file, select Transfer – Capture Text – Stop.
- The file can then be printed from an application such as Microsoft® Notepad or Word.

To use Hyper Terminal to print a report without saving it to a file:

- Select Transfer – Capture to Printer.
- On the UI, select the report to print. See Report section to select the report.
- As the report is uploading from the IPU board to the PC, it is displayed in the Hyper Terminal window.
- After the reports finish transferring to the PC, select Transfer – Capture to Printer to send the last page to the printer.

Report section

Press the PRINT key and enter the password. Press the √ key. Use the left or right arrow keys to navigate through the menu. The following reports are available to be printed:

STATUS

UNIT DATA

COOLING

COMP SYSTEM

SUPPLY SYSTEM

HEATING

ECONOMIZER

VENTILATION

EXHAUST

SETPOINTS

PROGRAM

OPTIONS

DATE / TIME

SCHEDULE

HOURS / STARTS

SERVICE

HISTORY BUFFER 1

HISTORY BUFFER 2

HISTORY BUFFER 3

HISTORY BUFFER 4

HISTORY BUFFER 5

HISTORY BUFFER 6

HISTORY BUFFER 7

HISTORY BUFFER 8

HISTORY BUFFER 9

HISTORY BUFFER 10

RUN TEST

PRINT ALL REPORTS

After selecting the report to print, press the √ key to output the report to the PC.

Service

To enter Service mode, press the SERVICE key. The following message initially displays when the SERVICE key is pressed unless a Level 2 password is active.

SERVICE
ENTER PASSWORD

All the DIGITAL outputs, except for the compressors, can be forced ON. In order to force the outputs, the local stop switch must be in the OFF position. To force an output ON, use the ◄ or ►

key to navigate to the SERVICE digital outputs section. Then use the ▲ or ▼ key to select the output to force ON. Press the √ key and then use the ► key to switch it from OFF to ON. Press the √ key again to energize the output. Repeat the above process in reverse to turn the forced output back to OFF.

All the ANALOG outputs can be forced ON. In order to force the outputs, the local stop switch must be in the OFF position. To force an output ON, use the ◄ or ► key to navigate to the SERVICE analog outputs section. Then use the ▲ or ▼ key to select the output you want to force ON. Press the √ key and then use the numeric keypad to enter the output value. Press the √ key again to energize the output. Repeat the above process in reverse to turn the forced output back to 0.0. *Failure to revert the forced output back to 0.0 leaves the forced output value in place until a different value is initiated by the operation of the unit*.

The ► key can be used to jump to the beginning of the next section of displays, and the ◄ key can be used to jump to the beginning of the previous section of displays.

The sections of displays are as follows:

- Parameters
- Analog inputs
- Digital inputs
- Digital outputs
- Analog outputs

Table 49 lists the displayed text, input or output type, IPU board terminal location (ID), value range, and when the item is displayed.

The following is an example of an analog input display that can be viewed from Service mode. See Table 49 for a listing of the analog inputs.

```
SERVICE AI PIO J07-01 XX.X VDC

+ BUILDING STATIC PRES =XX.XXINWC
```

Following is an example of a digital input display that can be viewed from Service mode. See Table 49 for a listing of the digital inputs.

```
SERVICE DI PIO TB08-01

LOCAL STOP RUN
```

Following is an example of a digital output display that can be viewed from Service mode. The XXX is replaced with OFF or ON in this section. See Table 49 for a listing of the digital outputs.

```
SERVICE DO PIO TB03-05

COMPRESSOR 2A OFF
```

Following is an example of an analog output display that can be viewed from Service mode. See Table 49 for a listing of the analog outputs

```
SERVICE AO PIO TB08-01 XX.X VDC

+ SYS 1 FEED VALVE OUTPUT =XXX.X %
```

Table 49: Service

Display text	Type	ID	Value range	Location	Description
Data log format			Off		Used To Activate The Data Log Feature Of The Control
Data log error	Error Detail		See Table 67		Data Log Error Detail (Only Displayed When Error Is Present)
	Error State		See Table 66		Data Log Error State (Only Displayed When Error Is Present)
Update flash			On / Off		Used To Update Control Software
Update flash error					Description Of The Error (Only Displayed When Error Is Present)
Factory run tester			User Disable / User Enable		Only Used For Factory Run Test
Compressor 1A	Digital Output	TB4-2	On / Off	I/O Board	Status Of The Digital Output To Compressor 1A
Compressor 1B	Digital Output	TB4-3	On / Off	I/O Board	Status Of The Digital Output To Compressor 1B
Compressor 2A	Digital Output	TB4-4	On / Off	I/O Board	Status Of The Digital Output To Compressor 2A
Compressor 2B	Digital Output	TB4-5	On / Off	I/O Board	Status Of The Digital Output To Compressor 2B
Compressor 3A	Digital Output	TB4-7	On / Off	I/O Board	Status Of The Digital Output To Compressor 3A
Compressor 3B	Digital Output	TB4-8	On / Off	I/O Board	Status Of The Digital Output To Compressor 3B
Condenser fan 1A/1	Digital Output	TB4-9	On / Off	I/O Board	Status Of Digital Output To Condenser Fan 1A
Condenser fan 1B/2	Digital Output	TB4-9	On / Off	I/O Board	Status Of Digital Output To Condenser Fan 1B
Condenser fan 2A/3	Digital Output	TB6-2	On / Off	I/O Board	Status Of Digital Output To Condenser Fan 2A
Condenser fan 2B/4	Digital Output	TB6-2	On / Off	I/O Board	Status Of Digital Output To Condenser Fan 2B
Condenser fan 3A/5	Digital Output	TB6-4	On / Off	I/O Board	Status Of Digital Output To Condenser Fan 3A
Condenser fan 3B/6	Digital Output	TB6-4	On / Off	I/O Board	Status Of Digital Output To Condenser Fan 3B
Electric heat stg 1	Digital Output	TB3-2	On / Off	I/O Board	Status Of Electric Heat Digital Output To Stage 1
Electric heat stg 2	Digital Output	TB3-3	On / Off	I/O Board	Status Of Electric Heat Digital Output To Stage 2
Electric heat stg 3	Digital Output	TB3-4	On / Off	I/O Board	Status Of Electric Heat Digital Output To Stage 3
Electric heat stg 4	Digital Output	TB3-5	On / Off	I/O Board	Status Of Electric Heat Digital Output To Stage 4

Table 49: Service

Display text	Type	ID	Value range	Location	Description
Electric heat stg 5	Digital Output	TB3-7	On / Off	I/O Board	Status Of Electric Heat Digital Output To Stage 5
Electric heat stg 6	Digital Output	TB3-8	On / Off	I/O Board	Status Of Electric Heat Digital Output To Stage 6
Electric heat stg 7	Digital Output	TB3-9	On / Off	I/O Board	Status Of Electric Heat Digital Output To Stage 7
Stg gas Furn 1 low	Digital Output	TB3-2	On / Off	I/O Board	Status Of Staged Gas Heat Digital Output To Stage 1 Low
Stg gas Furn 1 high	Digital Output	TB3-3	On / Off	I/O Board	Status Of Staged Gas Heat Digital Output To Stage 1 High
Stg gas Furn 2 low	Digital Output	TB3-4	On / Off	I/O Board	Status Of Staged Gas Heat Digital Output To Stage 2 Low
Stg gas Furn 2 high	Digital Output	TB3-5	On / Off	I/O Board	Status Of Staged Gas Heat Digital Output To Stage 2 High
Stg gas Furn 3 low	Digital Output	TB3-7	On / Off	I/O Board	Status Of Staged Gas Heat Digital Output To Stage 3 Low
Stg gas Furn 3 high	Digital Output	TB3-8	On / Off	I/O Board	Status Of Staged Gas Heat Digital Output To Stage 3 High
Mod gas Furn 1A low	Digital Output	TB3-2	On / Off	I/O Board	Status Of Mod Gas Heat Digital Output To Stage 1A Low
Mod gas Furn 1A high	Digital Output	TB3-3	On / Off	I/O Board	Status Of Mod Gas Heat Digital Output To Stage 1A High
Mod gas Furn 2 low	Digital Output	TB3-4	On / Off	I/O Board	Status Of Mod Gas Heat Digital Output To Stage 2 Low
Mod gas Furn 2 high	Digital Output	TB3-5	On / Off	I/O Board	Status Of Mod Gas Heat Digital Output To Stage 2 High
Mod gas Furn 3 low	Digital Output	TB3-7	On / Off	I/O Board	Status Of Mod Gas Heat Digital Output To Stage 3 Low
Mod gas Furn 3 high	Digital Output	TB3-8	On / Off	I/O Board	Status Of Mod Gas Heat Digital Output To Stage 3 High
Mod gas Furn 1B	Digital Output	TB3-9	On / Off	I/O Board	Status Of Mod Gas Heat Digital Output To Stage 1B
Pump down LLSV 1	Digital Output	TB5-2	On / Off	I/O Board	Status Of Pump Down Solenoid Llsv 1 Digital Output
Pump down LLSV 2	Digital Output	TB5-4	On / Off	I/O Board	Status Of Pump Down Solenoid Llsv 2 Digital Output
Pump down LLSV 3	Digital Output	TB5-6	On / Off	I/O Board	Status Of Pump Down Solenoid Llsv 3 Digital Output
Supply fan output	Digital Output	TB1-2	On / Off	Always	Status Of Supply Fan Digital Output

Table 49: Service

Display text	Type	ID	Value range	Location	Description
Return fan output	Digital Output	TB1-4	On / Off	I/O Board	Status Of Return Fan Digital Output
Exhaust fan output	Digital Output	TB1-4	On / Off	I/O Board	Status Of Exhaust Fan Or Return Fan Digital Output
VAV heat relay	Digital Output	TB1-12	On / Off	I/O Board	Status Of The Digital Output For The Vav Heat Relay
Fan fault	Digital Output	TB1-6	Okay / Faulted	I/O Board	Digital Output That Is Generated When There Is A Supply Fan Fault
Cool/heating fault	Digital Output	TB1-8	On / Off	I/O Board	Digital Output That Is Generated When There Is A Cooling/Heating Fault
Sensor/misc fault	Digital Output	TB1-10	On / Off	I/O Board	Digital Output That Is Generated When There Is A Sensor/Misc Fault
Supply fan vfd speed	Analog Output	TB9-1	0-10 V Dc	I/O Board	Analog Output To The Supply Fan VFD
Exhaust damper position	Analog Output	TB9-7	0-10 V Dc	I/O Board	Analog Output To The Exhaust Damper
Exhaust / return fan VFD	Analog Output	TB9-3	0-10 V Dc	I/O Board	Analog Output To The Exhaust Or Return Fan VFD
OA damper position	Analog Output	TB9-5	0-10 V Dc	I/O Board	Analog Output To The Economizer Dampers
Heating valve	Analog Output	TB9-9	0-10 V Dc	I/O Board	Analog Output To The Heating Valve
Bypass damper position	Analog Output	TB9-11	0-10 V Dc	I/O Board	Analog Output To The FlexSys Bypass Damper
Supply air temp current	Analog Input	J1-1	0-5 V	I/O Board	Analog Input From The Supply Or Mixed Air Sensor
MX supply air temp current	Analog Input	J1-1	0-5 V	I/O Board	Analog Input From The Supply Or Mixed Air Sensor
Heat exchanger temp	Analog Input	J1-2	0-5 V	I/O Board	Analog Input From The Temperature Sensor Positioned Before The Heat Section
Flex evap temp current	Analog Input	J1-3	0-5 V	I/O Board	Analog Input From The Temperature Sensors Positioned On The Leaving Side Of The Evaporator Coil
Outside air temp	Analog Input	J2-1	0-5 V	I/O Board	Analog Input From The Outdoor Air Temperature Sensor
Return air temp current	Analog Input	J2-2	0-5 V	I/O Board	Analog Input From The Return Air Temperature Sensor
Outside air humidity	Analog Input	J2-3	0-5 V	I/O Board	Analog Input From The Outdoor Air Humidity Sensor

Table 49: Service

Display text	Type	ID	Value range	Location	Description
Return air humidity	Analog Input	J2-4	0-5 V	I/O Board	Analog Input From The Return Air Humidity Sensor
Temperature suction 1	Analog Input	J3-1	0-5 V	I/O Board	Analog Input From The System 1 Suction Line Temperature Sensor
Temperature suction 2	Analog Input	J3-2	0-5 V	I/O Board	Analog Input From The System 2 Suction Line Temperature Sensor
Temperature suction 3	Analog Input	J3-3	0-5 V	I/O Board	Analog Input From The System 3 Suction Line Temperature Sensor
Pressure suction 1	Analog Input	J3-4	0-5 V	I/O Board	Analog Input From The System 1 Suction Pressure Transducer
Pressure suction 2	Analog Input	J4-1	0-5 V	I/O Board	Analog Input From The System 2 Suction Pressure Transducer
Pressure suction 3	Analog Input	J4-2	0-5 V	I/O Board	Analog Input From The System 3 Suction Pressure Transducer
Pressure discharge 1	Analog Input	J4-3	0-5 V	I/O Board	Analog Input From The System 1 Discharge Pressure Transducer
Pressure discharge 2	Analog Input	J4-4	0-5 V	I/O Board	Analog Input From The System 2 Discharge Pressure Transducer
Pressure discharge 3	Analog Input	J4-5	0-5 V	I/O Board	Analog Input From The System 3 Discharge Pressure Transducer
CO2 level outside	Analog Input	J5-2	0-5 V	I/O Board	Analog Input Of The Outdoor CO_2 Sensor
CO2 level inside	Analog Input	J5-3	0-5 V	I/O Board	Analog Input From The Indoor CO_2 Sensor
Return fan press current	Analog Input	J6-1	0-5 V	I/O Board	Analog Input From The Return Fan Pressure Transducer
Duct static press current	Analog Input	J6-2	0-5 V	I/O Board	Analog Input From The Supply Air Pressure Transducer
Building pressure current	Analog Input	J6-3	0-5 V	I/O Board	Analog Input From The Building Pressure Transducer
OA flow input 1	Analog Input	J6-4	0 To 4095 A/D Counts (1-5 V)	I/O Board	This Is The Air Flow Input From The Tek Air Measuring Station
OA flow input 2	Analog Input	J6-5	0 To 4095 A/D Counts (1-5 V)	I/O Board	This Is The Air Flow Input From The Tek Air Measuring Station
OA flow pressure 1	Analog Input	J6-4	0 To 0.25" W.C. (0-5 V)	I/O Board	Analog Input From The Air Measuring Station Pressure Transducer
OA flow pressure 2	Analog Input	J6-5	0 To 0.25" W.C. (0-5 V)	I/O Board	Analog Input From The Air Measuring Station Pressure Transducer

Table 49: Service

Display text	Type	ID	Value range	Location	Description
OA flow velocity 1	Analog Input	J6-4	0 To 2002 Fpm (0-5 V)	I/O Board	Analog Input From The Air Measuring Station Pressure Transducer
OA flow velocity 2	Analog Input	J6-5	0 To 2002 Fpm (0-5 V)	I/O Board	Analog Input From The Air Measuring Station Pressure Transducer
Zone temp current	Analog Input	J7-1	0-5 V	I/O Board	Analog Input From The Zone Temperature Sensor
Underfloor slab temp	Analog Input	J7-2	0-5 V	I/O Board	Analog Input From The Under Floor Temperature Sensor
Underfloor air humidity	Analog Input	J7-3	0-5 V	I/O Board	Analog Input From The Underfloor Humidity Sensor
Supply air temp rst	Analog Input	J7-4	0-5 V	I/O Board	Hardwired Analog Input To Reset The Supply Air Temperature Setpoint
Duct static pres reset	Analog Input	J7-5	0-5 V	I/O Board	Hardwired Analog Input To Reset The Duct Static Pressure Setpoint
Furnace status	Analog Input	J5-1	0-5 V	I/O Board	Analog Input Of The Furnace Multiplexer
Furnace 1A Stat hi	Digital Input	TB01-3	On / Off	Furnace Multiplexer	Furnace 1A Hz Status Input To Furnace Multiplexer Board
Furnace status counts	Analog Input	J5-1	0 - 4095	I/O Board	Status Of The Input From The Furnace Multiplexer Board In Count
Furnace 1 status	Digital Input	TB01-2	On / Off	Furnace Multiplexer	Furnace 1 Status Input To Furnace Multiplexer Board
Furnace 1A status	Digital Input	TB01-2	On / Off	Furnace Multiplexer	Furnace 1A Status Input To Furnace Multiplexer Board
Furnace 1B status	Digital Input	TB01-6	On / Off	Furnace Multiplexer	Furnace 1B Status Input To Furnace Multiplexer Board
Furnace 2 status	Digital Input	TB01-3	On / Off	Furnace Multiplexer	Furnace 2 Status Input To Furnace Multiplexer Board
Furnace 3 status	Digital Input	TB01-4	On / Off	Furnace Multiplexer	Furnace 3 Status Input To Furnace Multiplexer Board
Occupancy state	Digital Input	TB8-2	Occupied / Unoccupied	I/O Board	Hardwired Digital Input To Put The Unit Into The Occupied Mode
Local stop	Digital Input	TB8-1	Run / Stop	I/O Board	Digital Input That Turns The Unit On And Off
Fan (G)	Digital Input	TB8-8	On / Off	I/O Board	Hardwired Digital Input To Turn The Supply Fan On And Off
Y1 low cool	Digital Input	TB8-10	On / Off	I/O Board	Hardwired Digital Input To Place The Unit In First Stage Cooling Mode

Table 49: Service

Display text	Type	ID	Value range	Location	Description
Y2 high cool	Digital Input	TB8-11	On / Off	I/O Board	Hardwired Digital Input To Place The Unit In Second Stage Cooling Mode
W1 low heat	Digital Input	TB8-13	On / Off	I/O Board	Hardwired Digital Input To Place The Unit In First Stage Heating Mode
W2 high heat	Digital Input	TB8-14	On / Off	I/O Board	Hardwired Digital Input To Place The Unit In Second Stage Heating Mode
Safety input chain 1	Digital Input	TB7-1	Okay / Faulted	I/O Board	Digital Input From The Compressor System 1 Safety Circuit
Safety input chain 2	Digital Input	TB7-2	Okay / Faulted	I/O Board	Digital Input From The Compressor System 2 Safety Circuit
Safety input chain 3	Digital Input	TB7-4	Okay / Faulted	I/O Board	Digital Input From The Compressor System 3 Safety Circuit
Safety inputs LPCO 1	Digital Input	TB7-5	Okay / Faulted	I/O Board	Digital Input From The Compressor System 1 Low Pressure Safety Circuit
Safety inputs LPCO 2	Digital Input	TB7-7	Okay / Faulted	I/O Board	Digital Input From The Compressor System 2 Low Pressure Safety Circuit
Safety inputs LPCO 3	Digital Input	TB7-8	Okay / Faulted	I/O Board	Digital Input From The Compressor System 3 Low Pressure Safety Circuit
Supply fan output	Digital Input	TB7-10	Running / Stopped	I/O Board	Digital Input For The Supply Fan Run Verification Circuit
Exhaust fan status	Digital Input	TB7-11	Running / Stopped	I/O Board	Digital Input From The Exhaust Fan Run Verification Circuit
Return fan status	Digital Input	TB7-11	Running / Stopped	I/O Board	Digital Input From The Return Fan Run Verification Circuit
Filter status	Digital Input	TB7-13	Okay / Change	I/O Board	Digital Input From The Dirty Filter Pressure Switch
Hw/steam Frz stat	Digital Input	TB7-14	Okay / Faulted	I/O Board	Digital Input From The Hot Water Freezestat
Smoke purge 1	Digital Input	TB8-4	On / Off	I/O Board	Hardwired Digital Input To Place The Unit Is Smoke Purge 1 Mode
Smoke purge 2	Digital Input	TB8-5	On / Off	I/O Board	Hardwired Digital Input To Place The Unit Is Smoke Purge 2 Mode
Smoke purge 3	Digital Input	TB8-7	On / Off	I/O Board	Hardwired Digital Input To Place The Unit Is Smoke Purge 3 Mode

Table 49: Service

Display text	Type	ID	Value range	Location	Description
CO2 lvl inside BAS	Commun	Port P1	User Disable / User Enable	IPU Board	This Item Must Be Enabled In Order To Communicate A CO_2 Value To The Unit
CO2 lvl inside value BAS	Commun	Port P1	101 To 1899 Ppm	IPU Board	The Inside CO_2 Value Being Communicated To The Unit Through The Bas System
Duct pres reset BAS	Commun	Port P1	User Disable / User Enable	IPU Board	This Item Must Be Enabled In Order To Communicate A Duct Static Pressure Reset Value To The Unit
Duct static pres reset BAS	Commun	Port P1	0 To 100%	IPU Board	The Duct Static Reset Value Being Communicated To The Unit Through The Bas System
Exhaust control BAS	Commun	Port P1	Enable/Disable	IPU Board	Enables or disables control of the Modulating Exhaust Damper (Return Fan)
Exhaust damper/VFD	Commun	Port P1	0 To 100%	IPU Board	Communicates signal to set the position of the Modulating Damper (Return Fan) or speed of the Exhaust Fan.
Fan (G) BAS	Commun	Port P1	On / Off	IPU Board	Gives The Status Of The Communicated Fan G Input
Morning warm up cmd	Commun	Port P1	On / Off	IPU Board	Gives The Status Of The Communicated Morning Warm Up Command
Occupancy command	Commun	Port P1	Occupied / Unoccupied	IPU Board	Gives The Status Of The Communicated Occupancy Command
Smoke purge 1 BAS	Commun	Port P1	On Off	IPU Board	Gives The Status Of The Communicated Smoke Purge 1 Command
Smoke purge 2 BAS	Commun	Port P1	On Off	IPU Board	Gives The Status Of The Communicated Smoke Purge 2 Command
Smoke purge 3 BAS	Commun	Port P1	On Off	IPU Board	Gives The Status Of The Communicated Smoke Purge 3 Command
SAT reset BAS	Commun	Port P1	User Disable / User Enable	IPU Board	This Item Must Be Enabled In Order To Communicate A Supply Air Temperature Reset Value To The Unit
Supply air temp reset BAS	Commun	Port P1	0 To 5 V	IPU Board	The Supply Air Temperature Reset Value Being Communicated To The Unit Through The Bas System

Table 49: Service

Display text	Type	ID	Value range	Location	Description
System stop	Commun	Port P1	0 - Allows All Compressors To Operate; 1 - Turns Off Compressor System 1; 2 - Turns Off Compressor System 2; 3 - Turns Off Compressor System 3	IPU Board	Gives The Status Of The Communicated System Stop Command
Under flr humi BAS	Commun	Port P1	User Disable / User Enable	IPU Board	This Item Must Be Enabled In Order To Communicate A Under Floor Humidity Value To The Unit
Undrfloor air humidity BAS	Commun	Port P1	0 To 100%	IPU Board	The Under Floor Humidity Value Being Communicated To The Unit
Undr flr temp BAS	Commun	Port P1	User Disable / User Enable	IPU Board	This Item Must Be Enabled In Order To Communicate An Under Floor Temperature Value To The Unit
Underfloor slab temp BAS	Commun	Port P1	-20.0 °F To 180.0 °F	IPU Board	This Is The Actual Under Floor Temperature Value Being Communicated By The Bas System
Unit stop	Commun	Port P1	On / Off	IPU Board	Gives The Status Of The Communicated Unit Stop Command
W1 low heat BAS	Commun	Port P1	On / Off	IPU Board	Gives The Status Of The Communicated W1 Low Heat Command
W2 high heat BAS	Commun	Port P1	On / Off	IPU Board	Gives The Status Of The Communicated W2 High Heat Command
Y1 low cool BAS	Commun	Port P1	On / Off	IPU Board	Gives The Status Of The Communicated Y1 Low Cool Command
Y2 high cool BAS	Commun	Port P1	On / Off	IPU Board	Gives The Status Of The Communicated Y2 High Cool Command
Zone temp BAS	Commun	Port P1	-20.0 °F To 180.0 °F	IPU Board	Gives The Actual Value Of The Communicated Zone Temperature
Firmware crc	Derived		0 To 99999	Always	This Is The Size Of The Code In The Software And Is Not For Field Use
Real time ui - peak 5 sec and average	Derived				The Average And Peak Over The Last 5 Seconds Time Used By The User Interface. This Is Not For Field Use
Real time ui - lost and peak	Derived				The Lost And Peak Time Used By The User Interface. This Is Not For Field Use

Table 49: Service

Display text	Type	ID	Value range	Location	Description
Real time control - peak 5 sec and average	Derived				The Average And Peak Over The Last 5 Seconds Time Used By The Control. This Is Not For Field Use
Real time control - lost and peak	Derived				The Lost And Peak Time Used By The Control. This Is Not For Field Use
DE modifier address			-1 To 41943		Used To Enter A Specific DE Instance. See Communication.
DE modifier offset			-1 To 99		Used In Combination With The DE Modifier Address To Enter A Specific DE Instance. See Communication.
P1 baud rate			1200, 4800, 9600, 19200, 38400, 76800		Establishes The Communication Baud Rate For Port 1
P1 manual mac address			-1 To 127		Allows The Manual Entrance Of The Mac Address For Port 1. See Communication.
P1 parity			None, Even, Odd, Ignore		Do Not Change From Default Value For BACnet
P1 protocol			BACnet, Api		Keep Setting On BACnet
P1 stop bits			1-2		Do Not Change From Default Value For BACnet
P2 baud rate			1200, 4800, 9600, 19200, 38400, 57600		Establishes The Communication Baud Rate For Port 2
P2 manual mac address			-1 To 127		Allows The Manual Entrance Of The Mac Address For Port 2. See Communication.
P2 parity			None, Even, Odd, Ignore		Establishes The Parity For Communication Port 2
P2 protocol			Terminal, Modbus I/O, Modbus Server, Api, Modbus Client		Establishes The Protocol For Communication Port 2
P2 stop bits			1 - 2		Establishes The Stop Bit Setting For Communication Port 2
P3 baud rate			1200, 4800, 9600, 19200, 38400, 57600		Establishes The Communication Baud Rate For Port 3
P3 manual mac address			-1 To 127		Allows The Manual Entrance Of The Mac Address For Port 3. See Communication.
P3 parity			None, Even, Odd, Ignore		Establishes The Parity For Communication Port 3

Table 49: Service

Display text	Type	ID	Value range	Location	Description
P3 protocol			Terminal, Modbus I/O, Modbus Server, Api, Modbus Client		Establishes The Protocol For Communication Port 3
P3 stop bits			1 - 2		Establishes The Stop Bit Setting For Communication Port 3
P4 baud rate			1200, 4800, 9600, 19200, 38400, 57600		Establishes The Communication Baud Rate For Port 4
P4 manual mac address			-1 To 127		Allows The Manual Entrance Of The Mac Address For Port 4. See Communication.
P4 parity			None, Even, Odd, Ignore		Establishes The Parity For Communication Port 4
P4 protocol			Terminal, Modbus I/O, Modbus Server, Api, Modbus Client		Establishes The Protocol For Communication Port 4
P4 stop bits			1 - 2		Establishes The Stop Bit Setting For Communication Port 4
Connexsys error feature and detection	Derived				Not For Field Use
Connexsys error page and field	Derived				Not For Field Use
Connexsys error reason and valve	Derived				Not For Field Use
Real time problem string	Derived				Not For Field Use
Real time problem number	Derived				Not For Field Use
Real time problem	Derived				Not For Field Use

History

The HISTORY key gives the user access to Warning and Fault information. Many operating parameters and states are saved at the time of a fault. The history information can be viewed after entering the Level 2 password.

Table 50: Warning/fault order

Warning 1	Warning 2	Fault 1	Fault 2	Fault 3
		Fault 1	Fault 2	Fault 3
		Data	Data	Data

When the HISTORY key is pressed, the first active warning displays. When there are no active warnings, HISTORY 1 is displayed. When there are no faults, NO FAULT is displayed. Data is saved for faults, but it is not saved for warnings.

When a warning is displayed, the ► key advances to the next warning or HISTORY 1 after the last warning. The ◄ key returns to the previous warning or the highest HISTORY number before the first warning.

When a HISTORY # is displayed, the ► key advances to the next HISTORY # or Warning 1 after the last fault. The ◄ key returns to the previous HISTORY # or the highest warning number before

the first fault. Buffer number 1 is the most recent and buffer number 10 is the oldest HISTORY # saved. A maximum of 10 HISTORY #s are saved. The ▲ and ▼ key can be used to scroll forward and backward through the history buffer data.

The data following the initial history fault display, is displayed in the same order and with the same message used under the respective menu function:

- Status
- Unit Data
- Cooling
- Supply System
- Comp Sys 1
- Comp Sys 2
- Comp Sys 3
- Heating
- Economizer
- Ventilation
- Exhaust
- Hours/Starts

Pressing the ▼ key from a history fault display changes the display to the HISTORY menu format. The ► and ◄ keys are used to select a section. Pressing the HISTORY or **X** key returns to the history fault display. Pressing the ▼ key displays the next parameter in the selected list. From a parameter display, pressing the HISTORY or **X** key returns to the history fault display. See Navigation keys for instructions for navigating the parameter display.

For the following example, assume that there were three faults and one warning logged.

First, press the HISTORY key to get the password prompt. When a level 2 password is active, this prompt is skipped.

HISTORY ENTER PASSWORD

After entering the Level 2 password, the most recent warning is displayed.

HISTORY WARNING ◄► + WRN-BUILDING PRS

The ► key is pressed to move to the first fault.

HISTORY 01 31 OCT 2004 12:45:59 AM ◄► + LOCKOUT-DUCT PRS XDCR

The ► key is pressed to move to the next, older fault (fault # 2).

HISTORY 02 31 OCT 2004 10:42:39 AM ◄► AUTO RESET-MSAT SENSOR

The ► key is pressed to move to the next, older fault (fault # 3).

HISTORY 03 30 OCT 2004 02:11:23 PM ◄►
WRN-BUILDING PRS

The ▼ key is pressed to view data saved when fault #3 was detected.

HISTORY 03–STATUS ◄►
UNIT-OVERALL STATUS RUN

The ▼ key is pressed to view the second STATUS value.

HISTORY 03–STATUS ◄►
CURRENT OPER MODE RUN

The ► key is pressed to change to the next data section (UNIT DATA).

HISTORY 03–UNIT DATA ◄►
UNIT TYPE VARIABLE AIR VOLUME

Press the **X** or HISTORY key to go back to the history fault display.

HISTORY 03 30 OCT 2004 02:11:23 PM ◄►
WRN-BUILDING PRS

From history fault display, press the **X** key to return to the Power Up Banner display.

Password

Passwords are used to allow restricted access to the modification and viewing of certain parameters using the SETPOINTS, PROGRAM, OPTIONS, DATE/TIME, SCHEDULE, OPERATING HOURS / START COUNTER, PRINT, SERVICE, and HISTORY menu keys. The menus activated by each of these buttons can only be viewed after an acceptable password is entered. Each parameter is associated with a level of access. Each level of access is associated with a specific password. The access levels available are Level 1 or Level 2.

- If a parameter is tagged as Level 1, password of 9675 must be entered in order to change the value.
- If a parameter is tagged as Level 2, a password of 9725 must be entered in order to change the value. Entering the Level 2 password also allows the changing of a Level 1 parameter.

Pressing the SETPOINTS, PROGRAM, OPTIONS, DATE/TIME, SCHEDULE, OPERATING HOURS / START COUNTER, PRINT, SERVICE, or HISTORY key takes the user to the login prompt. When the user is first presented with the login prompt, the password field is blank. When the user wishes to change Level 1 or Level 2 parameters, the user must know the appropriate password. At that point, only the parameters changeable under the specific password level are displayed. For example, if the user presses the OPTIONS menu key and then enters a Level 1 password, the user is presented with a list of options parameters that have been tagged as Level 1. If the user enters a level 2 password, all parameters are displayed.

The password is entered by pressing the correct sequence of numerical keys (the 0 through 9 keys), then pressing the √ key. As digits are entered, asterisks are placed in the password field. Once entered, the menu system compares the password to a list of stored passwords. When the entered password matches one of the stored passwords, the user is allowed access at the specified level, and the display shows the first applicable parameter of the menu list with the appropriate edit prompts. When the password is incorrect, the screen displays Password Incorrect for two seconds and then reverts back to the login prompt. Pressing the **X** key during password entry cancels the password entry process and takes the user back to the login prompt.

Once a password is accepted, reentry of that password is not required until either the user presses a menu key other than SETPOINTS, PROGRAM, OPTIONS, DATE/TIME, SCHEDULE, OPERATING HOURS / START COUNTER, PRINT, SERVICE, or HISTORY or key activity is idle for 15 minutes. This ensures that the menu system reverts to password protection within an acceptable timeout.

Power up banner

When power is first applied to the control panel, a message displays for two seconds. The top line displays the copyright message. The bottom line displays the software version and the present date and time.

The software version number is shown in the following format:

C.ECO.ZZ.YY (control board released version), where:

- C = the product classification and stands for commercial unit
- ECO = the family code and stands for YORK® 70–105 ton rooftop unit air conditioner control panel
- ZZ = the product code
- YY = the version number

Connecting BAS to a rooftop unit with the IPU board

A rooftop unit with an IPU board ships from the factory ready to connect and communicate with a Building Automation System (BAS) utilizing BACnet MS/TP protocol.

The unit can also communicate via BACnet IP, LON, or N2 with the addition of a field provided/ installed component.

Communication

The IPU board is designed to communicate with a Building Automation System and a printer.

The Building Automation System communication uses BACnet protocol, MS/TP, Modbus I/O, Modbus Server, Modbus Client or Terminal. Other Building Automation system networks can be connected by using a router.

The printer communication uses ASCII protocol and RS-232 hardware.

Communication ports

The IPU Control board has four serial communication ports. BACnet MS/TP must use Port 1 and Terminal must use Port 2, which is the RS232 Port. Other protocols may be selected on Ports 3 or 4.

BACnet wiring

All BACnet devices are “daisy chained” together using a twisted pair, the (+) is connected to the (+) and the (-) to the (-). Do not connect wiring to terminals 1, 2 or 5. The connections on the PORT 1 connector are as follows:

1 - 5V

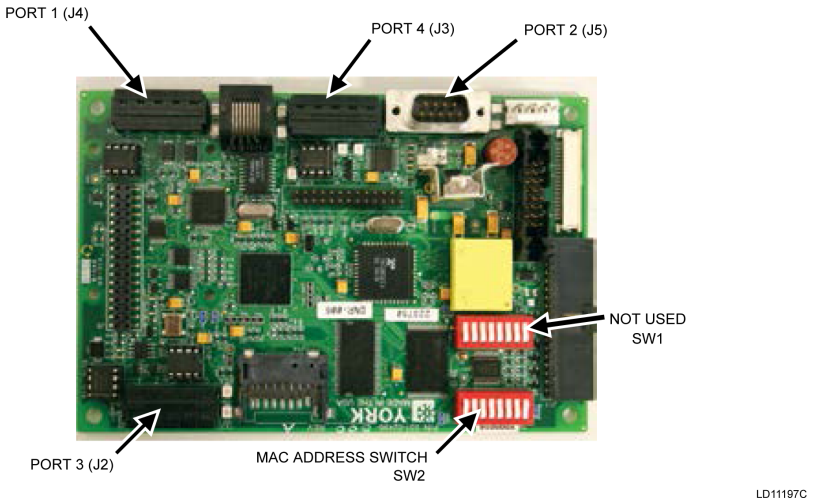
2 - Ground

3 - Receive (-)

4 - Transmit (+)

5 - Open

Figure 61: IPU control board

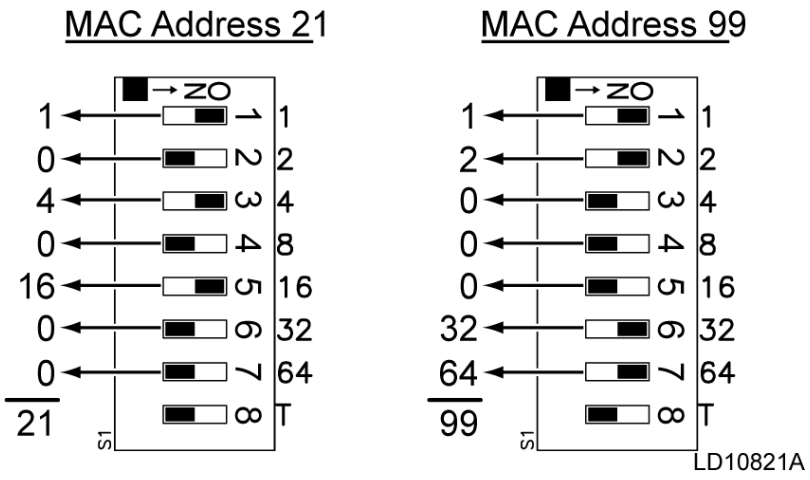


Device object instance (DE)

The unit is shipped to automatically establish the DE address after the MAC address is established using the MAC address switches ON the IPU or through the User Interface. The default Device Object Instance (DE) would be 23000 plus the MAC address. For example, If you had a MAC address of 10 the default Object Instance (DE) would be 23010.

The MAC address can be set in two ways using the MAC Address Switches ON the IPU or though the SERVICE key of the User Interface. The 8-way binary switch uses seven of the rockers to set the MAC address. The network address must be between 1 and 127. To determine the node address, add the value of each DIP switch in the ON position as shown in Figure 61. Switch 8 must always be in the ON position to allow terminal operation.

Figure 62: MAC address switches



As stated above the MAC address can also be set using the SERVICE key. Go to parameter PI MANUAL MAC ACCESS. Press the √ key and enter the MAC address number using the numeric keypad and then press the √ key again. The MAC address can be a number from 0 to 127. If the MAC address is entered using the User Interface the control will ignore any values entered through the MAC Address Switches. In order to make the MAC Address switches active again a value of –1 would need to be entered for the PI MANUAL MAC ACCESS. In order to use the above procedure to establish the Device Object Instance (DE) the value for DE MODIFIER OFFSET MUST BE SET TO –1.

In most applications the above procedure allows the Device Object Instance (DE) to be established. Some applications may request that the Device Object Instance (DE) be set to a given value. This can be done through the user interface. To do this you would use the DE MODIFIER ADDRESS in conjunction with the DE MODIFIER OFFSET. Using this feature the Device Object Instance (DE) would be the (DE MODIFIER ADDRESS X 100) plus DE MODIFIER OFFSET. For example, if you wanted a DE address of 2010, the DE MODIFIER ADDRESS to 20 and the DE MODIFIER OFFSET to 10. The Device Object instance (DE) is limited to a value between 0 and 4,194,303.

The DE MODIFIER ADDRESS and the DE MODIFIER OFFSET are both set using the SERVICE key of the User Interface. Go to parameter DE MODIFIER ADDRESS. Press the √ key to enter the DE Modifier Address number using the numeric keypad and then press the √ key again. Then go to parameter DE MODIFIER OFFSET. Press the √ key to enter the DE Modifier Offset number using the numeric keypad and then press the √ key again.

Additional settings

The following parameters can also be programmed using the SERVICE key:

PORT 1

“P1 BAUD RATE”

“P1 MANUAL MAC ADDRESS”

“P1 PARITY”

“P1 PROTOCOL”

“P1 STOP BITS”

PORT 2

“P2 BAUD RATE”

“P2 MANUAL MAC ADDRESS”

“P2 PARITY”

“P2 PROTOCOL”

“P2 STOP BITS”

PORT 3

“P3 BAUD RATE”

“P3 MANUAL MAC ADDRESS”

“P3 PARITY”

“P3 PROTOCOL”

“P3 STOP BITS”

PORT 4

“P4 BAUD RATE”

“P4 MANUAL MAC ADDRESS”

“P4 PARITY”

“P4 PROTOCOL”

“P4 STOP BITS”

Table 51 gives the BACnet name, BACnet Object Type and Instance, and the Modbus Register Address for the available communication points.

⚠ CAUTION

Any time a change is made to the MAC address using the DIP switches or a change to the above communication parameters using the SERVICE key of the User Interface the main power to the unit must be cycled OFF and back ON to change the value in memory.

Table 51: BACnet MS/TP, Modbus, BACnet IP

BACnet name	User interface name	Read/ write	BACnet object type and instance	Modbus register address	Points list description
ACT_DSP_SP	DUCT STATIC PRESS ACTIVE SP	R	AI01	514	Displays the active duct static pressure setpoint.
ACT_MIN_FLOW	ACTIVE MIN AIRFLOW	R	AI02	515	Displays The minimum ventilation air (CFM) setpoint when the unit has an air flow monitoring station.
ACT_MIN_POS	ACTIVE MIN POSITION	R	AI03	516	Displays the minimum OA damper position (%) when the unit is fixed minimum ventilation control.
ACT_SAT_SP	ACTIVE SUPPLY AIR TEMP SP	R	AI04	517	CV or VAV: displays the active supply air temperature setpoint. Flexsys: If the current mode is Occ Cooling W/O Bypass, this is equal to the MX SAT SP (MIXD_SAT_LIM; AV14). If the current mode is Occ Cooling W/Bypass, this is equal to either the Evap Leaving High SP (EL_AIR_TMP_H; AV07) or the Evap Leaving Low SP (EL_AIR_TMP_L; AV08) depending on the system conditions.
ACT_SLAB_CTL	ACTIVE SLAB CONTROL	R/W	AV77 BV01	1102	Allows the active slab control to be turned on or off (0=Off, 1=On).
AMORN_WA_ACT	ADAPTIVE MORN WARM UP STATUS	R	BI01	-	Displays the status of the adaptive morning warmup.
ARS_RAT_SNSR	AUTO RESET-RAT SENSOR	R	BI67	-	Displays the unit is in an alarm due to the RAT sensor being out of range.
BLD_STAT_PRS	BUILDING PRESS CURRENT	R	AI05	518	Displays the current building pressure (in. w.c.).
BULD_PRES_SP	BUILDING PRESS ACTIVE SP	R/W	AV01	1026	Displays the active building pressure setpoint.

Table 51: BACnet MS/TP, Modbus, BACnet IP

BACnet name	User interface name	Read/ write	BACnet object type and instance	Modbus register address	Points list description
BYPASS_DAMPER	BYPASS DAMPER POSITION	R	AI06	519	Displays the actual bypass damper position.
CO2_1_OUT	CO2 LEVEL OF THE OA	R	AI07	520	Displays the actual OA air CO_2 (PPM).
CO2_2_IN	CO2 LEVEL OF THE OA	R	AI08	521	Displays the actual RA air CO_2 (PPM).
CO2_INSIDE	CO2 LEVEL INSIDE VALUE BAS	R/W	AV43	1168	A BAS entered value for the inside CO_2 level. CO_2 LVL Inside BAS must be enabled using the service key to use this point.
CO2_OFFSET	CO2 OFFSET ACTIVE SP	R/W	AV02	1027	Displays the value (PPM) that the indoor CO_2 must rise above the outside CO_2 to activate demand ventilation.
COL/HEAT_FLT	COOLING/HEATING FAULT STATUS	R	BI02	1283	Displays the status of the cooling or heating system (0=No Fault, 1=Fault).
COMFORT_VENT	COMFORT VENT STATUS	R/W	AV78 BV02	1103	Displays the status of the comfort ventilation option and allows it to be turned on or off (0=Off, 1=On).
COMP_1A	COMP 1A STATUS	R	BI03	1284	Displays the status of compressor 1A (0=Off, 1=On).
COMP_1A_OPER	COMP 1A OPER HRS	R	AI09	522	Displays the operating hours of compressor 1A.
COMP_1B	COMP 1B STATUS	R	BI04	1285	Displays the status of compressor 1B (0=Off, 1=On).
COMP_1B_OPER	COMP 1B OPER HRS	R	AI10	523	Displays the operating hours of compressor 1B.
COMP_2A	COMP 2A STATUS	R	BI05	1286	Displays the status of compressor 2A (0=Off, 1=On).
COMP_2A_OPER	COMP 2A OPER HRS	R	AI11	524	Displays the operating hours of compressor 2A.
COMP_2B	COMP 2B STATUS	R	BI06	1287	Displays the status of compressor 2B (0=Off, 1=On).
COMP_2B_OPER	COMP 2B OPER HRS	R	AI12	525	Displays the operating hours of compressor 2B.
COMP_3A	COMP 3A STATUS	R	BI07	1288	Displays the status of compressor 3A (0=Off, 1=On).
COMP_3A_OPER	COMP 3A OPER HRS	R	AI13	526	Displays the operating hours of compressor 3A.
COMP_3B	COMP 3B STATUS	R	BI08	1289	Displays the status of compressor 3B (0=Off, 1=On).
COMP_3B_OPER	COMP 3B OPER HRS	R	AI14	527	Displays the operating hours of compressor 3B.

Table 51: BACnet MS/TP, Modbus, BACnet IP

BACnet name	User interface name	Read/ write	BACnet object type and instance	Modbus register address	Points list description
COMP_LPCO_1	LPCO CIRCUIT 1 STATUS	R	BI09	1290	Displays the status of the low pressure switch on circuit 1 (0=Fault, 1=No fault).
COMP_LPCO_2	LPCO CIRCUIT 2 STATUS	R	BI10	1291	Displays the status of the low pressure switch on circuit 2 (0=Fault, 1= No fault).
COMP_LPCO_3	LPCO CIRCUIT 3 STATUS	R	BI11	1292	Displays the status of the low pressure switch on circuit 3 (0=Fault, 1=No fault).
COMP_STAT_1	SAFETY CHAIN CIRCUIT 1 STATUS	R	BI12	1293	Displays the status of circuit 1 safety chain (0=Fault 1=No fault).
COMP_STAT_2	SAFETY CHAIN CIRCUIT 2 STATUS	R	BI13	1294	Displays the status of circuit 2 safety chain (0=Fault, 1=No fault).
COMP_STAT_3	SAFETY CHAIN CIRCUIT 3 STATUS	R	BI14	1295	Displays the status of circuit 3 safety chain (0=Fault, 1=No fault).
COND_FAN_1A	COND FAN 1A/1 STATUS	R	BI15	1296	Displays the status of condenser fan 1A/1 (0=Off, 1=On).
COND_FAN_1B	COND FAN 1B/2 STATUS	R	BI16	1297	Displays the status of condenser fan 1B/2 (0=Off, 1=On).
COND_FAN_2A	COND FAN 2A/3 STATUS	R	BI17	1298	Displays the status of condender fan 2A/3 (0=Off, 1=On).
COND_FAN_2B	COND FAN 2B/4 STATUS	R	BI18	1299	Displays the status of condenser fan 2B/4 (0=Off, 1=On).
COND_FAN_3A	COND FAN 3A/5 STATUS	R	BI19	1300	Displays the status of condenser fan 3A/5 (0=Off, 1=On).
COND_FAN_3B	COND FAN 3B/6 STATUS	R	BI20	1301	Displays the status of condenser fan 3B/6 (0=Off, 1=On).
COND_FAN_SPD	COND FAN SPEED	R	AI15	528	Not used at this time. For future use.
CONTINU_VENT	CONTINUOUS VENTILATION STATUS	R/W	AV79 BV03	1104	Displays the status of the continuous ventilation option and allows for it to be turned on or off (0=Off, 1=On).
DCT_ST_PR_RT	DUCT STATIC PRESS RESET	R	AI16	529	Displays the status of the hardwired duct static reset value to CTB1 (%).
DCT_STAT_PRS	DUCT STATIC PRESS CURRENT	R	AI17	530	Displays the actual duct static pressure (in. w.c.).
DEW_PNT_RST	DEW POINT RESET	R/W	AV80 BV04	1105	Allows the dew point reset feature to be turned on or off (0=Off, 1=On).

Table 51: BACnet MS/TP, Modbus, BACnet IP

BACnet name	User interface name	Read/ write	BACnet object type and instance	Modbus register address	Points list description
DSP_HI_LIMIT	DUCT STATIC RESET HIGH SP	R/W	AV03	1028	Displays the duct static high setpoint.
DSP_LO_LIMIT	DUCT STATIC RESET LOW SP	R/W	AV04	1029	Displays the duct static low setpoint.
DSP_RST_BAS	DUCT STATIC PRESS RESET BAS	R/W	AV05	1030	A BAS value that causes the reset of the duct static press setpoint between two high and low values. Duct Pres RST Bas must be enabled through the service key to use this point,
ECON_ME_USED	ECON METHOD ACTIVE	R	AI18	531	Displays the status of the active economizer mode (1=Dry bulb, 2=Single enthalpy, 3=Dual enthalpy, 4=Best method avail).
ECON_STATUS	ECON SYSTEM STATUS	R	AI19	532	Displays the status of the economizer (1=Installed and active, 2=Not installed, 3=Disabled).
ECONO_INSTAL	ECONOMIZER SYSTEM	R/W	AV81 BV05	1106	Allows the economizer feature to be turned on or off (0=Off, 1=On).
ECONO_METHOD	ECON METHOD TO USE	R/W	AV06	1031	Allows for the selection of the economizer method to use (1=Dry bulb, 2=Single enthalpy, 3=Dual enthalpy, 4=Best method avail).
EL_AIR_TMP_H	EVAP LEAVING AIR TEMP HIGH SP	R/W	AV07	1032	Displays the active setpoint for the high evap leaving air temperatire. This is the setpoint the compressors are controlled to (**OCC Cooling W/ Bypass**).
EL_AIR_TMP_L	EVAP LEAVING AIR TEMP LOW SP	R/W	AV08	1033	Displays the active setpoint for the low evap leaving air temperature. This is the setpoint the compressors are controlled to (**OCC Cooling W/ Bypass**).
EVAP_AIR_TMP	EVAP AIR TEMP CURRENT	R	AI20	533	Displays the actual temperature of the air leaving the evaporator (**OCC Cooling W/ Bypass**).
EXH_CTRL_BAS	EXHAUST CONTROL BAS	R/W	BV24		When enabled, this allows the BAS to control the exhaust fan speed. It can be enabled through the BAS or at the unit controller in the Service menu.
EXH_DAMPER/VFD	EXH FAN SPEED INPUT	R/W	AV52	-	The speed the exhaust fan operates at when EXH_CTRL_BAS is set to User Enabled.

Table 51: BACnet MS/TP, Modbus, BACnet IP

BACnet name	User interface name	Read/ write	BACnet object type and instance	Modbus register address	Points list description
EXH_FAN_STAT	EXHAUST FAN STATUS	R	BI21	1302	Displays the status of the exhaust fan proving circuit (0=Open, 1=Closed).
EXHAUST_FAN	EXH FAN OUTPUT STATUS	R	BI22	1303	Displays the status of the exhaust fan output (0=Off, 1=On).
EXHAUST_OUT	EXH DAMPER POSITION	R	AI21	534	Displays the control output to the exhaust damper (%).
FAN_FAULT	FAN FAULT STATUS	R	BI23	1304	Displays the status of the supply, exhaust, or return fan fault (0=No fault, 1=Fault).
FAN_G	FAN (G) BAS STATUS	R	BI24	1305	Displays the status of the fan (G) input, either hardwired (CTB1) or communicated (BAS) (0=Off, 1=On).
FAN_G_BAS	FAN (G) BAS	R/W	AV82 BV06	1107	A BAS command that allows the fan (G) input to be turned on or off (0=Off, 1=On).
FAULT_1	FAULT 1	R	AI71	-	Displays active fault number 1. See Table 64 and Table 65.
FAULT_2	FAULT 2	R	AI72	-	Displays active fault number 2. See Table 64 and Table 65.
FAULT_3	FAULT 3	R	AI73	-	Displays active fault number 3. See Table 64 and Table 65.
FAULT_4	FAULT 4	R	AI74	-	Displays active fault number 4. See Table 64 and Table 65.
FAULT_5	FAULT 5	R	AI75	-	Displays active fault number 5. See Table 64 and Table 65.
FAULT_6	FAULT 6	R	AI76	-	Displays active fault number 6. See Table 64 and Table 65.
FAULT_7	FAULT 7	R	AI77	-	Displays active fault number 7. See Table 64 and Table 65.
FAULT_8	FAULT 8	R	AI78	-	Displays active fault number 8. See Table 64 and Table 65.
FAULT_9	FAULT 9	R	AI79	-	Displays active fault number 9. See Table 64 and Table 65.
FAULT_10	FAULT 10	R	AI80	-	Displays active fault number 10. See Table 64 and Table 65.
FILTER_STATS	FILTER STATUS	R	BI25	1306	Displays the status of the dirty filter input (0=No fault, 1=Fault).
FURN_OUT_1	ELECT HEAT STAGE 1 STATUS	R	BI26	1307	Displays the status of the control output to the indicated heat section (0=Off, 1=On).
	STAGED GAS FURN 1 LO STATUS				
	MOD GAS FURN 1A LOW STATUS				

Table 51: BACnet MS/TP, Modbus, BACnet IP

BACnet name	User interface name	Read/ write	BACnet object type and instance	Modbus register address	Points list description
FURN_OUT_2	ELECT HEAT STAGE 2 STATUS STAGED GAS FURN 1 HIGH STATUS MOD GAS FURN 1A HIGH STATUS	R	BI27	1308	Displays the status of the control output to the indicated heat section (0=Off, 1=On).
FURN_OUT_3	ELECT HEAT STAGE 3 STATUS STAGED GAS FURN 2 LOW STATUS MOD GAS FURN 2 LOW STATUS	R	BI28	1309	Displays the status of the control output to the indicated heat section (0=Off, 1=On).
FURN_OUT_4	ELECT HEAT STAGE 4 STATUS STAGED GAS FURN 2 HIGH STATUS MOD GAS FURN 2 HIGH STATUS	R	BI29	1310	Displays the status of the control output to the indicated heat section (0=Off, 1=On).
FURN_OUT_5	ELECT HEAT STAGE 5 STATUS STAGED GAS FURN 3 LOW STATUS MOD GAS FURN 3 LOW STATUS	R	BI30	1311	Displays the status of the control output to the indicated heat section (0=Off, 1=On).
FURN_OUT_6	ELECT HEAT STAGE 6 STATUS STAGED GAS FURN 3 HIGH STATUS MOD GAS FURN 3 HIGH STATUS	R	BI31	1312	Displays the status of the control output to the indicated heat section (0=Off, 1=On).
FURN_OUT_7	ELECT HEAT STAGE 7 STATUS MOD GAS FURN 1B STATUS	R	BI32	1313	Displays the status of the control output to the indicated heat section (0=Off, 1=On).
HEAT_ENABLE	HEATING SYSTEM	R/W	AV83 BV07	1108	A BAS command that allows the heating function to be turned on or off (0=Enabled, 1=Disabled).
HEAT_ENT_TEMP	HEAT ENTERING TEMP	R	AI22	535	Displays the actual temperature of the air entering the elect, staged gas, or mod gas heat sections.
HEAT_STAGES	ELECTRIC HEAT OR GAS HEAT STAGES	R	AI23	536	Displays the number of elect or staged gas heat stages available.
HEAT_VACTION	HW/STEAM VALVE ACTION	R/W	AV84 BV08	1109	A BAS command that allows the hot water or steam valve action to be changed (0=Direct, 1=Reverse).
HEATING_SAT	HEATING SAT SP	R/W	AV09	1034	Displays the active supply air temperature setpoint for heating.

Table 51: BACnet MS/TP, Modbus, BACnet IP

BACnet name	User interface name	Read/ write	BACnet object type and instance	Modbus register address	Points list description
HEATING_VLV	HEATING VALVE	R	AI24	537	Displays the ouput from the control to a hot water or steam valve or mod gas heat valve (%).
HGRH_BLEED_V	HGRH BLEED VALVE	R	BI77	-	Displays the active position of the HGRH bleed valve.
HGRH_CONTROL	HGRH CONTROL	R/W	BV25	-	A BAS command that allows the HGRH system to be enabled or disabled (0=Enabled, 1=Disabled).
HGRH_RAT_HST	HGRH RAT SP FOR HIGH SAT	R/W	AV57	-	Displays the RAT setpoint used to control to the HGRH high SAT setpoint when HGRH is active.
HGRH_RAT_LST	HGRH RAT SP FOR LOW SAT	R/W	AV58	-	Displays the RAT setpoint used to control to the HGRH low SAT setpoint when HGRH is active.
HGRH_SAT_ASP	HGRH SAT ACTIVE SP	R	AI81	-	Displays the active setpoint when the HGRH is active. This is the setpoint the HGRH valve is trying to maintain.
HGRH_SAT_HSP	HGRH SAT HIGH SP	R/W	AV59	-	Displays the upper limit for the HGRH SAT when HGRH is active (°F).
HGRH_SAT_LSP	HGRH SAT LOW SP	R/W	AV60	-	Displays the lower limit for the HGRH SAT when HGRH is active (°F).
HGRH_VLV_POS	HGRH VALVE POSITION	R	AI67	-	Displays the active position of the HGRH valve.
HUM_LVL_BAS	HUMIDITY LEVEL BAS	R/W	AV61	-	Allows the BAS to input a zone humidity reading (% RH).
HW_FRZ_STAT	HW/STEAM FREEZESTAT STATUS	R	BI33	1314	Displays the status of the freezestat on units with hot water steam heat (0=No fault, 1=Fault).
LCK_OAT_SNSR	LOCKOAT-OAR SENSOR	R	BI66	-	Displays the unit is in an alarm due to the OAT sensor being out of range.
LOCAL_STOP	LOCAL STOP STATUS	R	BI34	1315	Displays the status of the 24 VAC input to the control board through the SD terminal or the unit on/off switch.
MAX_BYPASS	MAXIMUM BYPASS SP	R/W	AV10	1035	Displays the maximum setting for the bypass damper.
MAX_FLOW_DV	OUTSIDE AIR MAX FLOW SP	R/W	AV11	1036	Displays the maximum airflow for demand ventilation with an airflow station (CFM).

Table 51: BACnet MS/TP, Modbus, BACnet IP

BACnet name	User interface name	Read/ write	BACnet object type and instance	Modbus register address	Points list description
MECH_LCK_TMP	MECH COOLING LOCKOUT TEMP	R/W	AV12	1037	Displays the minimum OA temperature at which mech cooling is allowed to operate.
MIN_FLOW_DV	OUTSIDE AIR MIN FLOW SP	R/W	AV13	1038	Displays the minimum airflow for demand ventilation with an airflow station (CFM).
MIN_OA_FLO	MINIMUM OA FLOW SETPOINT	R/W	AV51	-	A R/W point that allows the minimum OA flow setpoint to be changed from the BAS.
MIXD_SAT_LIM	MX SAT SP	R/W	AV14	1039	Displays the active mixed air temperature setpoint (**OCC Cooling W/O Bypass-Compressor Control**) or (**OCC Cooling W/ Bypass-Damper Control**).
MORN_WARM_UP	MORNING WARM UP	R/W	AV85 BV09	1110	A BAS command that allows morning warmup to be enabled or disabled (0=Enabled, 1=Disabled).
MORN_WUP_CMD	MORNING WARMUP COMMAND	R/W	AV86 BV10	1111	A BAS command that starts or stops morning warmup (0=Off, 1=On).
NIGHT_SETBAC	NIGHT SET BACK	R/W	AV87 BV11	1112	A BAS command that allows night set back to be turned on or off (0=Off, 1=On).
OAH_CURR_BAS	OUTSIDE HUNIDITY BAS	R/W	AV56	-	Allows the BAS to input an outside air humidity value (% RH). Outside air humidity BAS must be user enabled in the service key.
OAT_CURR_BAS	OUTSIDE TEMP BAS	R/W	AV55	-	Allows the BAS to input an outside air temp value (°F). Outside air temp BAS must be user enabled in the service key.
OA_DAMP_POS1	OA DAMPER MIN POSITION	R/W	AV16	1041	Displays the active setpoint for the minimum OA damper when using fixed minimum ventilation and the supply fan VFD is at 100%.
OA_DAMP_POS2	OA DAMPER MAX POSITION	R/W	AV17	1042	Displays the maximum position for the OA damper when using fixed minimum ventilation and the supply fan VFD is at 50%.
OA_DAMPER	OA DAMPER POSITION CURRENT	R	AI25	538	Displays the position of the OA damper (%).
OA_DRYB_LIMT	OA DRYBULB SP	R/W	AV54	-	Displays the OA drybulb setpoint used for econ control when econ is set for dry bulb.

Table 51: BACnet MS/TP, Modbus, BACnet IP

BACnet name	User interface name	Read/ write	BACnet object type and instance	Modbus register address	Points list description
OA_ENTH_LIMIT	OA ENTHALPY SP	R/W	AV18	1043	Displays the maximum enthalpy setpoint for using OA for cooling (BTU/lb) single or dual enthalpy.
OA_ENTHALPY	OA ENTHALPY	R	AI26	539	Displays the current OA enthalpy (BTU/lb).
OA_FLO_PRS_1	OA FLOW PRESS 1	R	AI27	540	Not used
OA_FLO_PRS_2	OA FLOW PRESS 2	R	AI28	541	Not used
OA_FLOW_1	IAQ DAMPER AIR FLOW OA FLOW 1	R	AI61	574	Displays the air flow through a tek-air full IAQ air measuring station (CFM).
OA_FLOW_2	IAQ DAMPER AIR FLOWS OA FLOW 2	R	AI62	575	Not used
OA_FLOW_TOTL	OA FLOW TOTAL	R	AI63	576	Displays the total air flow through a tek-air full IAQ air measuring station (CFM).
OA_REL_HUMID	OA HUMIDITY CURRENT	R	AI29	542	Displays the current OA relative humidity (%).
OA_TEMP	OA TEMPERATURE CURRENT	R	AI30	543	Displays the current OA temperature.
OAT_HIGH_SAT	OA TEMP FOR HIGH SAT SP	R/W	AV19	1044	Displays the OA temperature setpoint used for switching to the high supply air temperature setpoint.
OAT_LOW_SAT	OA TEMP FOR LO SAT SP	R/W	AV20	1045	Displays the OA temperature setpoint used for switching to the low supply air temperature setpoint.
OCC_MODE	OCCUPANCY MODE STATUS	R	BI35	1316	Displays the OCC or UNOCC status with hardwired, communicated, or internal clock schedule input (Ena=Enabled/OCC, Dis=Disabled/UNOCC).
OCC_STATE	OCCUPANCY STATE STATUS	R	BI36	1317	Displays the status of the hardwired input (Ena=Enabled/OCC, Dis=Disabled/UNOCC).
OCC_ZN_COOL	OCC ZONE COOLING SP	R/W	AV21	1046	Displays the active occupied zone cooling setpoint.
OCC_ZN_HEAT	OCC ZONE HEATING SP	R/W	AV22	1047	Displays the active occupied zone heating setpoint.
OCCUPNCY_CMD	OCCUPANCY COMMAND	R/W	AV88 BV12	1113	A BAS command that allows the unit to be placed in the OCC or UNOCC mode (0=UNOCC, 1=OCC).
PRS_1_DISCH	DISCH PRESS CKT 1	R	AI31	544	Displays the current disch pressure of circuit 1 (PSIG).
PRS_1_SUCT	SUCT PRESS CKT 1	R	AI32	545	Displays the current suction pressuse of circuit 1 (PSIG).
PRS_2_DISCH	DISCH PRESS CKT 2	R	AI33	546	Displays the current disch pressure of circuit 2 (PSIG).

Table 51: BACnet MS/TP, Modbus, BACnet IP

BACnet name	User interface name	Read/ write	BACnet object type and instance	Modbus register address	Points list description
PRS_2_SUCTION	SUCT PRESS CKT 2	R	AI34	547	Displays the current suction pressure of circuit 2 (PSIG).
PRS_3_DISCH	DISCH PRESS CKT 3	R	AI35	548	Displays the current disch pressure of circuit 3 (PSIG).
PRS_3_SUCT	SUCT PRESS CKT 3	R	AI36	549	Displays the current suction pressure of circuit 3 (PSIG).
PUMP_DOWN	PUMP DOWN	R/W	AV89 BV13	1114	A BAS command that allows the pump down feature to be turned on or off (0=On, 1=Off).
PUMP_DOWN_1	PUMP DOWN LLSV 1 STATUS	R	BI37	1318	Displays the status of the output to the circuit 1 liquid line solenoid valve (0=On, 1=Off).
PUMP_DOWN_2	PUMP DOWN LLSV 2 STATUS	R	BI38	1319	Displays the status of the output to the circuit 2 liquid line solenoid valve (0=On, 1=Off).
PUMP_DOWN_3	PUMP DOWN LLSV 3 STATUS	R	BI39	1320	Displays the status of the output to the circuit 3 liquid line solenoid valve (0=On, 1=Off).
RA_DIFF_BAS	RETURN AIR DIFF SP BAS	R/W	AV42	1067	Displays the active differential setpoint between the RAT and the maximum SAT setpoint which is utilized in the internal logic for selecting the proper Flexsys cooling mode: **OCC COOLING W/ BYPASS** or **OCC COOLING W/O BYPASS** .
RA_HUM_ACT	RA HUMIDITY CURRENT	R	AI82	-	Displays the active humidity value (% RH).
RAT_COOL_SP	COOLING RAT SP	R/W	AV23	1048	Displays the active return air temperature setpoint for cooling.
RAT_HEAT_SP	HEATING RAT SP	R/W	AV15	1040	Displays the active RAT setpoint for heating.
RAT_HIGH_SAT	RAT SP FOR HIGH SAT	R/W	AV24	1049	Displays the RA temperature setpoint used for switching to the high supply air temperatire setpoint.
RAT_LOW_SAT	RAT SP FOR LOW SAT	R/W	AV25	1050	Displays the RA temperature setpoint used for switching to the low supply air temperature setpoint.
RDY_RUN_C1A	READY TO RUN COMP 1A STATUS	R	BI40	1321	Displays the status of compressor 1A. It is ready to run if the compressor is off (Yes/No).

Table 51: BACnet MS/TP, Modbus, BACnet IP

BACnet name	User interface name	Read/ write	BACnet object type and instance	Modbus register address	Points list description
RDY_RUN_C1B	READY TO RUN COMP 1B STATUS	R	BI41	1322	Displays the status of compressor 1B. It is ready to run if the compressor is off (Yes/No).
RDY_RUN_C2A	READY TO RUN COMP 2A STATUS	R	BI42	1323	Displays the status of compressor 2A. It is ready to run if the compressor is off (Yes/No).
RDY_RUN_C2B	READY TO RUN COMP 2B STATUS	R	BI43	1324	Displays the status of compressor 2B. It is ready to run if the compressor is off (Yes/No).
RDY_RUN_C3A	READY TO RUN COMP 3A STATUS	R	BI44	1325	Displays the status of compressor 3A. it is ready to run if the compressor is off (Yes/No).
RDY_RUN_C3B	READY TO RUN COMP 3B STATUS	R	BI45	1326	Displays the status of compressor 3B. it is ready to run if the compressor is off (Yes/No).
RDY_STOP_C1A	READY TO STOP COMP 1A STATUS	R	BI46	1327	Displays the status of compressor 1A. It is ready to stop if it is operating (Yes/ No).
RDY_STOP_C1B	READY TO STOP COMP 1B STATUS	R	BI47	1328	Displays the status of compressor 1B. It is ready to stop if it is operating (Yes/ No).
RDY_STOP_C2A	READY TO STOP COMP 2A STATUS	R	BI48	1329	Displays the status of compressor 2A. It is ready to stop if it is operating (Yes/ No).
RDY_STOP_C2B	READY TO STOP COMP 2B STATUS	R	BI49	1330	Displays the status of compressor 2B. It is ready to stop if it is operating (Yes/ No).
RDY_STOP_C3A	READY TO STOP COMP 3A STATUS	R	BI50	1331	Displays the status of compressor 3A. It is ready to stop if it is operating (Yes/ No).
RDY_STOP_C3B	READY TO STOP COMP 3B STATUS	R	BI51	1332	Displays the status of compressor 3B. It is ready to stop if it is operating (Yes/ No).
RET_AIR_BY_S	RETURN AIR BYPASS ACTIVE SP	R	AI37	550	Displays the value (%) for the current setpoint of the RA bypass damper on a Flexsys unit.
RET_AIR_ENTH	RA ENTHALPY CURRENT	R	AI38	551	Displays the actual RA enthalpy (BTU/lb).
RET_AIR_HUMD	RA HUMIDITY CURRENT	R	AI39	552	Displays the actual RA relative humidity (%).
RET_AIR_TEMP	RAT CURRENT	R	AI40	553	Displays the actual RA temperature (°F).

Table 51: BACnet MS/TP, Modbus, BACnet IP

BACnet name	User interface name	Read/ write	BACnet object type and instance	Modbus register address	Points list description
RET_FAN_OUT	EXHAUST/RETURN FAN VFD	R	AI41	554	Displays the output from the control to the exhaust or return fan VFD (%).
RET_FAN_PRES	RETURN FAN PRESSURE CURRENT	R	AI42	555	Displays the actual pressure that is used to control the return fan speed (in. w.c.).
RET_FAN_STAT	RETURN FAN STATUS	R	BI52	1333	Displays the status of the return fan run verification circuit (0=Stop/ Verification Ckt Open, 1=Run/Verification Ckt Closed).
RST_ENT_BAS	RESET ENTHALPY SP BAS	R/W	AV41	1066	Displays the RA enthalpy setpoint that causes the unit to switch from the evap leaving high setpoint to the evap leaving low setpoint.
SAT_HIGH_LIM	SAT HIGH SP	R/W	AV26	1051	Displays the upper limit for the SAT setpoint on a VAV unit (°F).
SAT_LOW_LIM	SAT LOW SP	R/W	AV27	1052	Displays the lower limit for the SAT setpoint on a VAV unit (°F).
SAT_RST_BAS	SAT RESET BAS	R/W	AV28	1053	Displays the analog input from the BAS system that allows the reset of the active SAT setpoint. 0 uses SAT high setpoint and 5 uses SAT low setpoint. SAT RST BAS must be enabled in the service menu for this point to function.
SAT_SUC_TMP1	SATURATED SUCT TEMP CKT 1	R	AI43	556	Displays the saturation temperature of system 1 suction gas based on system 1 suction pressure (°F).
SAT_SUC_TMP2	SATURATED SUCT TEMP CKT 2	R	AI44	557	Displays the saturation temperature of system 2 suction gas based on system 2 suction pressure (°F).
SAT_SUC_TMP3	SATURATED SUCT TEMP CKT 3	R	AI45	558	Displays the saturation temperature of system 3 suction gas based on system 3 suction pressure (°F).
SAT_TEMPER	SUPPLY AIR TEMPERING STATUS	R	BI53	1334	Displays the status of supply air tempering (On/Off).
SEN/MSC_FLT	SENSOR/MISC FAULT STATUS	R	BI54	1335	Displays the status of a sensor or misc fault (0=No fault, 1=Fault).

Table 51: BACnet MS/TP, Modbus, BACnet IP

BACnet name	User interface name	Read/ write	BACnet object type and instance	Modbus register address	Points list description
SF_PROV_SW	SUPPLY FAN STATUS	R	BI55	1336	Displays the status of the supply fan air proving circuit (0=Stop Verification/Ckt Open, 1=Run Verification/ Ckt Closed).
SF_SPD_INPUT	SUPPLY FAN SPEED INPUT	R	AI66	-	Displays the speed input signal from the BAS when SF sync is user enabled.
SF_SPD_H_SAT	FAN SPEED SP FOR HIGH SAT	R/W	AV29	1054	Displays the supply fan speed setpoint used for switching to the high SAT setpoint.
SF_SPD_L_SAT	FAN SPEED SP FOR LOW SAT	R/W	AV30	1055	Displays the supply fan speed setpoint used for switching to the low SAT setpoint.
SMOKE_PUR_1	SMOKE PURGE 1 STATUS	R	BI56	1337	Displays the status of the smoke purge 1 input either hardwired or communicated (On/Off).
SMOKE_PUR_2	SMOKE PURGE 2 STATUS	R	BI57	1338	Displays the status of the smoke purge 2 input either hardwired or communicated (On/Off).
SMOKE_PUR_3	SMOKE PURGE 3 STATUS	R	BI58	1339	Displays the status of the smoke purge 3 input either hardwired or communicated (On/Off).
SMOKE_PUR1_B	SMOKE PURGE 1 BAS	R/W	AV90 BV14	1115	A BAS command that allows smoke purge 1 to be activated (0=Off 1=On).
SMOKE_PUR2_B	SMOKE PURGE 2 BAS	R/W	AV91 BV15	1116	A BAS command that allows smoke purge 2 to be activated (0=Off 1=On).
SMOKE_PUR3_B	SMOKE PURGE 3 BAS	R/W	AV92 BV16	1117	A BAS command that allows smoke purge 3 to be activated (0=Off 1=On).
STG_1_COOL	FIRST STAGE COOLING SP	R/W	AV31	1056	This is the active setpoint for first stage cooling with a zone sensor input.
STG_1_HEAT	FIRST STAGE HEATING SP	R/W	AV32	1057	This is the active setpoint for first stage heating with a zone sensor input.
STG_2_COOL	SECOND STAGE COOLING SP	R/W	AV33	1058	This is the active setpoint for second stage cooling with a zone sensor input.
STG_2_HEAT	SECOND STAGE HEATING SP	R/W	AV34	1059	This is the active setpoint for second stage heating with a zone sensor input.

Table 51: BACnet MS/TP, Modbus, BACnet IP

BACnet name	User interface name	Read/ write	BACnet object type and instance	Modbus register address	Points list description
SUP_AIR_TEMP	SAT CURRENT	R	AI46	559	CV or VAV: Displays the actual temperature of the supply air (°F).
	MAX SAT CURRENT				Flexsys: Displays the actual temperature of the maximum SAT (°F).
SUP_AIR_TRST	SAT RESET	R	AI47	560	Displays The value, 0-5 VDC, of a hardwired or communicated input that is used to reset the SAT setpoint.
SUP_FAN_VFD	SUPPLY FAN VFD SPEED	R	AI48	561	Displays the output from the control to the supply fan VFD (%).
SUPPLY_FAN	SUPPLY FAN OUTPUT STATUS	R	BI59	1340	Displays the status of the output from the controller to the supply fan circuit (0=Off, 1=On).
SYSTEM_STOP	SYSTEM STOP	R/W	AV35	1060	Allows a BAS command that manually shuts down compressor circuits (0=All circuits can operate, 1=Shuts down circuit 1, 2=Shuts down circuit 2, 3=Shuts down circuit 3).
SZ_MIN_VFD	SINGLE ZONE MINIMUM VFD	R/W	AV53	-	This is the minimum speed the supply fan VFD will operate at when in single zone VAV mode.
TEMP_1_SUCT	SUCT TEMP CKT 1	R	AI49	562	Displays the actual system 1 suction line temperature (°F).
TEMP_1_SUPER	SUCT SUPERHEAT CKT 1	R	AI50	563	Displays the system 1 superheat (°F).
TEMP_2_SUCT	SUCT TEMP CKT 2	R	AI51	564	Displays the actual system 2 suction line temperature (°F).
TEMP_2_SUPER	SUCT SUPERHEAT CKT 2	R	AI52	565	Displays the system 2 superheat (°F).
TEMP_3_SUCT	SUCT TEMP CKT 3	R	AI53	566	Displays the actual system 3 suction line temperature (°F).
TEMP_3_SUPER	SUCT SUPERHEAT CKT 3	R	AI54	567	Displays the system 3 superheat (°F).
UND_FLR_DEWP	UNDERFLOOR SLAB DEWPOINT CURRENT	R	AI55	568	Displays the calculated dew point of the underfloor air (°F).
UND_FLR_HUMD	UNDERFLOOR HUMIDITY CURRENT	R	AI56	569	Displays the humidity value of the underfloor air (% RH).
UND_FLR_TEMP	UNDEFLOOR SLAB TEMP CURRENT	R	AI57	570	Displays the temperature of the underfloor slab (°F).

Table 51: BACnet MS/TP, Modbus, BACnet IP

BACnet name	User interface name	Read/ write	BACnet object type and instance	Modbus register address	Points list description
UND_HUMD_BAS	UNDERFLOOR HUMIDITY BAS	R/W	AV36	1061	Allows the BAS system to input an underfloor air humidity value to the control (% RH). Under FLR Humi BAS must be enabled in the service menu for this point to function.
UND_TEMP_BAS	UNDERFLOOR SLAB TEMP BAS	R/W	AV37	1062	Allows the BAS system to input an underfloor slab temp value to the control (°F). Under FLR Temp BAS must be enabled in the service menu for this point to function.
UNIT_MODE	UNIT MODE	R	AI58	571	0=OCC Cooling 1=OCC Cooling Low 2=OCC Cooling High 3=OCC Cooling W/ Bypass 4=OCC Cooling W/O Bypass 5= OCC Heating 6=OCC Heating Low 7=OCC Heating High 8=OCC Standby 9=UNOCC Cooling 10=UNOCC Cooling Low 11=UNOCC Cooling High 12=UNOCC Heating 13=UNOCC Heating Low 14=UNOCC Heating High 15=UNOCC Standby 16=Comfort Vent Cooling 17=Comfort Vent Heating 18=Night Set-Back 19=Morning Warm-Up 20=OCC Dehum W/Cool 21=OCC Dehum Cool Hi 22=OCC Dehum Cool Lo 23=UNOCC Dehum W/Cool 24=UNOCC Dehum Cool Hi 25=UNOCC Dehum Cool Lo
UNIT_STOP	UNIT STOP	R/W	AV93 V17	1118	A BAS command that allows the unit to be shut down (0=Normal operation, 1=Unit stopped).
UNSTABLE_SYS	UNSTABLE SYSTEM STATUS	R	BI60	-	Not used
UNOCC_ZN_COOL	UNOCC ZONE COOLING SP	R/W	AV38	1063	Displays the UNOCC zone cooling setpoint
UNOCC_ZN_HEAT	UNOCC ZONE HEATING SP	R/W	AV39	1064	Displays the UNOCC zone heating setpoint.

Table 51: BACnet MS/TP, Modbus, BACnet IP

BACnet name	User interface name	Read/ write	BACnet object type and instance	Modbus register address	Points list description
VAV_HEAT	VAV HEAT RELAY STATUS	R	BI61	1342	Displays the status of the output that energizes a VAV heat relay (Off/On).
VENT_CONTROL	VENTILATION CONTROL	R/W	AV94 BV18	1119	A BAS command that allows the selection of the ventilation function (0=Fixed minimum, 1=Demand).
VENT_DEM_OUT	VENTILATION DEMAND	R	AI59	572	Displays the status of the ventilation output for demand ventilation (%).
VENT_ENABLE	VENTILATION SYSTEM	R/W	AV95 BV19	1120	A BAS command that allows the ventilation function to be turned on or off (0=Off, 1=On).
WARNING_1	WARNING 1	R	AI68	-	Displays active warning number 1. See Table 63.
WARNING_2	WARNING 2	R	AI69	-	Displays active warning number 2. See Table 63.
WARNING_3	WARNING 3	R	AI70	-	Displays active warning number 3. See Table 63.
WN_DMPR_NOMD	WRN-DAMPER NOT MODULATING	R	BI68	-	Displays a warning that a damper is not modulating per the economizer feedback sequence.
WN_E_SNS_FLT	WRN-ECONO SENSOR FAULT	R	BI69	-	Displays a warning that a temperature sensor in the economizer system is out of range.
WN_XCES_ECON	WRN-EXCESS ECONOMIZER	R	BI70	-	Displays a warning that the economizer system is not working properly.
WN_EXCES_O_A	WRN-EXCESS OUTSIDE AIR	R	BI71	-	Displays a warning that the economizer system is not working properly.
WN-NOT-ECONO	WRN-NOT ECONOMIZING	R	BI72	-	Displays a warning that the unit is not economizing when it should be.
WN_OA_DA_STK	WRN-AO DAMPER ACTUATOR STUCK	R	BI73	-	Displays a warning that the OA damper is stuck per economizer feedback.
WN_RA_DA_STK	WRN-RA DAMPER ACTUATOR STUCK	R	BI74	-	Displays a warning that the RA damper is stuck per the economizer feedback.
WN_OUTSID_RH	WRN-OUTSIDE AIR RH	R	BI75	-	Displays a warning that the OA RH% is out of range.
WN_RETURN_RH	WRN-RETURN AIR RH	R	BI76	-	Displays a warning that the RA RH% is out of range.
W1_LO_HEAT_B	W1 LOW HEAT BAS	R/W	AV96 BV20	1121	A BAS command that allows an input for W1, first stage heat (0=Off 1=On).
W1_LOW_HEAT	W1 LOW HEAT STATUS	R	BI62	1343	Displays the status of the W1 heat input either hardwired or communicated from a BAS (On/Off).

Table 51: BACnet MS/TP, Modbus, BACnet IP

BACnet name	User interface name	Read/ write	BACnet object type and instance	Modbus register address	Points list description
W2_HI_HEAT_B	W2 HIGH HEAT BAS	R/W	AV97 BV21	1122	A BAS command that allows an input for W2, second stage heat (0=Off, 1=On).
W2_HIGH_HEAT	W2 HIGH HEAT STATUS	R	BI63	1344	Displays the status of the W2 heat input either hardwired or communicated from a BAS (On/Off).
Y1_LO_COOL_B	Y1 LOW COOL BAS	R/W	AV98 BV22	1123	A BAS command that allows an input for Y1, first stage cool (0=Off, 1=On).
Y1_LOW_COOL	Y1 LOW COOL STATUS	R	BI64	1345	Displays the status of the Y1 cool input either hardwired or communicated from a BAS (On/Off).
Y2_HI_COOL_B	Y2 HIGH COOL BAS	R/W	AV99 BV23	1124	A BAS command that allows an input for Y2, second stage cool (0=Off, 1=On).
Y2_HIGH_COOL	Y2 HIGH COOL STATUS	R	BI65	1346	Displays the status of the Y2 cool input either hardwired or communicated from a BAS (On/Off).
ZN_COOL_ASP	ZONE COOLING ACTIVE SP	R	AI64	-	Displays the active zone cooling setpoint.
ZN_HEAT_ASP	ZONE HEATING ACTIVE SP	R	AI65	-	Displays the active zone heating setpoint.
ZONE_TEMP	ZONE TEMP CURRENT	R	AI60	573	Displays The actual zone temperature (°F).
ZONE_TEMP_BAS	ZONE TEMP BAS	R/W	AV40	1065	Allows the BAS to input a zone temperature reading (°F). The control method must be set to Comm Zone Temp for this point to function.

Note:

1. The most up to date listing of the standard points mapping can be found on the YORK website.
2. For a BAS using BACnet IP, a gateway must be used because the IPU board does not have a BACnet IP port. We recommend using a YORK NCE (MS-NCE2560-0).

Parameter descriptions and options

Table 52: Definitions

Menu item	Definition
Active slab control	This parameter is programmed through the PROGRAM key. This function allows heat to be turned ON during the transition from Unoccupied to Occupied mode or Occupied to Unoccupied mode if the under floor conditions of a FlexSys system are right for the growth of mold and mildew. The choices are USER ENABLED or USER DISABLED.
Adapt morn warm up	This parameter is programmed through the PROGRAM key. Adaptive Morning Warm Up uses the past three days of warm up times and temperatures to calculate the start time for the current day. This parameter allows the user to USER ENABLED or USER DISABLED this feature.
Bldg pressure cntrl offset	This parameter is programmed through the SETPOINTS key. The IPU board To determine when to turn on the exhaust fan. When the exhaust option is configured for ON-OFF PRESS CNTRL.
Building pressure active setpoint	This parameter is programmed through the SETPOINTS key. It identifies the control point for the building pressure.
Building pressure current	This is the actual pressure in the conditioned space.
Bypass damper position	This is the actual position of the bypass damper, by percent open, in a FlexSys unit.
CO_2 level inside	This is the CO_2 level of the air in the conditioned space.
CO_2 level outside	This is the CO_2 level of the outdoor air.
CO_2 offset setpoint	This parameter is programmed through the SETPOINTS key. The Outside CO_2 level must be lower than the Indoor CO_2 level plus the CO_2 OFFSET SETPOINT before the outdoor door damper will start to open for additional ventilation.
CO_2 offset current	This represents the current difference between the CO_2 LEVEL INSIDE versus the CO_2 LEVEL OUTSIDE.
Comfort ventilation	This parameter is programmed through the PROGRAM key. This function is only used on a Constant Volume unit. The IPU board monitors the Return Air Temperature and energizes stages of cooling or heating prior to a demand from the space. This function is only active when the unit is in the Occupied mode. The choices are USER ENABLED or USER DISABLED.
Comp SYS 1 Status	This is the current operating mode of the system 1 compressors. The display will show Normal - Comp A On, Normal - Comp B On, Normal - Both ON, Normal - Both Off, Safety Trip, Safety Fault, Safety Lockout, Low Amb Inhibit, Low Suct Temp Unl, High DP Unload, or User Disabled.
Comp SYS 2 Status	This is the current operating mode of the system 2 compressors. The display will show Normal - Comp A On, Normal - Comp B On, Normal - Both ON, Normal - Both Off, Safety Trip, Safety Fault, Safety Lockout, Low Amb Inhibit, Low Suct Temp Unl, High DP Unload, or User Disabled.
Comp SYS 3 Status	This is the current operating mode of the system 3 compressors. The display will show Normal - Comp A On, Normal - Comp B On, Normal - Both ON, Normal - Both Off, Safety Trip, Safety Fault, Safety Lockout, Low Amb Inhibit, Low Suct Temp Unl, High DP Unload, or User Disabled.
Condenser fan 1A/1	This identifies if the IPU board has sent a Binary output to Condenser Fan 1A /1.
Condenser fan 1B/2	This identifies if the IPU board has sent a Binary output to Condenser Fan 1B /2.
Condenser fan 2A/3	This identifies if the IPU board has sent a Binary output to Condenser Fan 2A /3.
Condenser fan 2B/4	This identifies if the IPU board has sent a Binary output to Condenser Fan 2B/4.
Condenser fan 3A/5	This identifies if the IPU board has sent a Binary output to Condenser Fan 3A /5.
Condenser fan 3B/6	This identifies if the IPU board has sent a Binary output to Condenser Fan 3B/6.
Continuous vent	This parameter is programmed through the PROGRAM key. This is only used on a Constant Volume unit. When this parameter is enabled the supply blower will operate whenever the unit is in the Occupied mode. The choices are USER ENABLED or USER DISABLED.
Control method	This parameter is programmed through the OPTIONS key and identifies the control method being used on a Constant Volume unit. The choices are Staged, Wired Zone Temp or Comm Zone Temp.

Table 52: Definitions

Menu item	Definition
Cooling control offset	This is the control band the unit is trying to maintain. The control band is the Active Setpoint +/- the Cooling Control Offset. If the temperature is above this band additional cooling is required, if the temperature is below this band cooling is decreased.
Current oper mode	This is the current operating mode of the unit. The display will show OCC Standby, OCC Cooling Low, OCC Cooling High, OCC Heating Low, OCC Heating High, UNOCC Standby, Unnocc Cooling Low, UNOCC Cooling High, UNOCC Heating Low, UNOCC Heating High, Morning Warm-up, Comfort Vent Cooling, Comfort Vent Heating, Occupied Cooling, Occupied Heating, Unoccupied Cooling, Unoccupied Heating, OCC Cooling W/O Bypass, OCC Cooling W Bypass, or Underfloor Temp Override.
Current run time comp A	This is the amount of time the compressor has been in operation during the current cycle. This is shown for each compressor of every compressor system.
Current run time comp B	This is the amount of time the compressor has been in operation during the current cycle. This is shown for each compressor of every compressor system.
Daily warm up time	This is the time it takes to bring the Return Air Temperature up to setpoint during Adaptive Morning Warm Up. The IPU board uses this value in the calculation of Daily Warm Up Time Day 1.
Daily warm up time day 1	This is the Morning Warm Up time the IPU board recorded during the previous day 1. This value is used to calculate the current Morning Warm initiate time for Adaptive Morning Warm Up.
Daily warm up time day 2	This is the Morning Warm Up time the IPU board recorded during the previous day 2. This value is used to calculate the current Morning Warm initiate time for Adaptive Morning Warm Up.
Daily warm up time day 3	This is the Morning Warm Up time the IPU board recorded during the previous day 3. This value is used to calculate the current Morning Warm initiate time for Adaptive Morning Warm Up.
Damper hardware	This parameter is programmed through the OPTIONS key and identifies the type of ventilation system installed in the unit. The choices are None, 2 Position Damper, Standard Dampers, TEK-AIR.
Dew point reset	This parameter is programmed through the PROGRAM key. This function changes the Active Supply Air Temperature to a lower value when the air beneath the floor of a FlexSys unit approaches the dew point temperature of the air. The choices are USER ENABLED or USER DISABLED.
Display language	This parameter is programmed through the OPTIONS key. This allows the user to select the language the IPU board will use to display the information at the User Interface. The choices are English or Spanish.
Display units	This parameter is programmed through the OPTIONS key. This allows the user to select which unit of measure the IPU board will use to display the information at the User Interface. The choices are Imperial, metric.
Duct press transducer span	This parameter is programmed through the SETPOINTS key. This allows the use of three different duct pressure control ranges, 0 to**1.00 in. w.g.**, 0 to **2.50 in. w.g.**, or 0 to **5.00 in. w.g.**.
Duct static over pressure	This parameter is programmed through the SETPOINTS key. This sets the maximum allowable Duct Static value before the IPU board lockouts the unit on an over pressure fault.
Duct static press active SP	This is the current Duct Static Setpoint that the IPU board is trying to maintain.
Duct static press current	This is the actual duct static pressure value.
Duct static reset low setp	This parameter is programmed through the SETPOINTS key. This is the minimum Duct Static Control point.
Duct static reset high setp	This parameter is programmed through the SETPOINTS key. This is the maximum Duct Static Control point.
Economizer control output	This is the analog output from the IPU board to the Economizer Damper Actuator.
Econo installed	This parameter is programmed through the PROGRAM key and tells the IPU board what type of economizer is installed, None, Dry Bulb, Single Enthalpy, Dual Enthalpy.
Econo method active	This value indicates which of the available economizer methods the IPU board is using.

Table 52: Definitions

Menu item	Definition
Econo method to use	This parameter is programmed through the PROGRAM key and tells the IPU board which of the available economizer options to use. The choices are Dry Bulb, Single Enthalpy, Dual Enthalpy, or Best Available.
Econo output for fan start	This parameter is set through the SETPOINTS key and identifies the position of the economizer damper required to turn ON the exhaust fan in an ON/OFF DAMPER CTRL.
Econo output for fan stop	This parameter is set through the SETPOINTS key and identifies the position of the economizer damper required to turn off the exhaust fan in an ON/OFF DAMPER CTRL option.
Econo sys status	This is the active status of the economizer system, display will show Normal- Active, Normal-Inactive, Faulted, User Disabled; or None.
Elec heat capacity	This parameter is programmed through the OPTIONS key. This parameter is used to identify the electric heat capacity installed in the unit. The options are 40 KW, 80 KW, 40 KW-200, 80 KW-200, 100 KW, 100 KW-200, 108 KW, 120 KW, 150 KW, 160 KW, 200 KW, 240 KW, or 250 KW.
Evap leaving air temp high	This parameter is programmed through the SETPOINTS key. This becomes the Active Supply Air Temperature Setpoint for a FlexSys unit when it is in the Occupied Cooling With Bypass mode.
Evap leaving air temp low	This parameter is programmed through the SETPOINTS key. This becomes the Active Supply Air Temperature Setpoint for a FlexSys unit when it is in the Dew Point Reset mode.
Exhaust damper position/VFD	This identifies the percentage output from the IPU board to the Exhaust Damper or Exhaust Fan when controlled by the unit or BAS (when exhaust Control BAS is enabled).
Exhaust fan output	This identifies the IPU board is sending a Binary output to energize the exhaust fan circuit.
Exhaust fan status	This verifies a Binary input to the IPU board is present when the exhaust fan is operating.
Exhaust output for fan start	This parameter is set through the SETPOINTS key and identifies the position of the exhaust damper required to turn ON the exhaust fan in an ON/OFF PRESS CNTRL option.
Exhaust output for fan stop	This parameter is set through the SETPOINTS key and identifies the position of the exhaust damper required to turn off the exhaust fan in an ON/OFF PRESS CNTRL option.
Exhaust/return fan VFD	This is a derived value that indicates the output, in percent, to the Return Fan VFD.
Exhaust sys status	This is the active status of the exhaust system. The display will show Normal-Active, Normal-Inactive, Faulted, User Disabled, or None.
Exhaust/return fan VFD	This identifies speed output in percentage that is being sent to the exhaust or return fan VFD.
Fan speed setp for high SAT	This parameter is programmed through the SETPOINTS key. When the supply fan speed is equal to or less than this value the Active Supply Air Temperature Setpoint on a Variable Air Volume Unit is set to the SAT Setpoint High Limit.
Fan speed setp for low SAT	This parameter is programmed through the SETPOINTS key. When the supply fan speed is equal to or greater than this value the Active Supply Air Temperature Setpoint on a Variable Air Volume Unit is set to the SAT Setpoint Low Limit.
Filter status	This is status of the unit filters. A differential pressure switch must be installed to measure the pressure drop across the filters. When the filters are dirty the switch closes sending a Binary signal to the IPU board. The User Interface display will show Okay or Change.
Flex evap temp active SP	This is the active evaporator temperature setpoint that the IPU board is trying to control to. This value is used when a FlexSys unit is in the Occupied Cooling With Bypass mode.
Flex evap temp current	This is the actual air temperature leaving the evaporator coil of a FlexSys unit.
Furnace 1 mode	This is the current status of the first heat exchanger section of a staged gas heat unit. The User Interface will display Off, Purge, Ignition, On-Low, On-High, Safety Trip, Safety Fault, Safety Lockout, or Fault- I/O.

Table 52: Definitions

Menu item	Definition
Furnace 1A mode	This is the current status of the modulating section of the modulating gas heat furnace. The User Interface will display Off, Purge, Ignition, On-Low, On-High, Safety Trip, Safety Fault, Safety Lockout, or Fault- I/O.
Furnace 1B mode	This is the current status of the non-modulating section of the modulating gas heat furnace. The User Interface will display Off, Purge, Ignition, On, Safety Trip, Safety Fault, Safety Lockout, or Fault- I/O.
Furnace 2 mode	This is the current status of the second heat exchanger section of a staged gas heat unit. The User Interface will display Off, Purge, Ignition, On-Low, On-High, Safety Trip, Safety Fault, Safety Lockout, or Fault- I/O.
Furnace 3 mode	This is the current status of the third heat exchanger section of a staged gas heat unit. The User Interface will display Off, Purge, Ignition, On-Low, On-High, Safety Trip, Safety Fault, Safety Lockout, or Fault- I/O.
Gas heat capacity	This parameter is programmed through the OPTIONS key. This parameter is used to identify the gas heat capacity installed in the unit. The options are 375 MBH, 750 MBH, or 1125 MBH.
Heat entering temp	This is the temperature of the supply air entering the staged heat section. This value is used to initiate and terminate Supply Air Tempering when Staged Heat is installed.
Heat limit temperature	This parameter is programmed through the SETPOINTS key. This value determines the maximum allowable Supply Air Temperature when heating is installed. If the temperature goes above this setting the heat section is shut down.
Heating control offset	This is the control band the unit is trying to maintain. The control band is the Active Setpoint +/- the Heating Control Offset. If the temperature is below this band, additional heating is required, if the temperature is above this band heating is decreased.
Heating SAT	This parameter is programmed through the SETPOINTS key. On a VAV or FlexSys unit this becomes the Active Supply Air Temperature Setpoint for heating operation. The IPU board controls the heating option to try and maintain this temperature.
Heating sys status	This is the current operating mode of the Heating Section. The display will show Normal - Active, Normal - Inactive, Safety Trip, Safety Fault, Safety Lockout, User Disabled, or None.
Heating system type	This parameter is programmed through the OPTIONS key. This parameter is used to identify the type of heat installed in the unit. The options are None, Electric, Stage Gas, Modulating Gas, Hot Water / Steam.
Hw / steam frz stat	This is the status of the hydronic heat freezestat. This is done through a Binary input to the IPU board. The switch is open for normal operation and closed on failure. The User Interface will indicate OK or FAULTED.
Hw / steam heat - valve pos	This is the output from the IPU board to the hydronic valve as percent open.
Hw valve action	This parameter is programmed through the PROGRAM key. This parameter controls the output to the hydronic modulating valve. When the parameter is set to DIRECT the output is 0 volts for off and 10 volts for full capacity. When the parameter is set to REVERSE the output is 10 volts for off and 0 volts for full capacity.
Maximum bypass	This parameter is programmed through the SETPOINTS key. It establishes the maximum allowable position of the bypass damper in a FlexSys unit.
Mech clg lockout temp	This parameter is programmed through the SETPOINTS key. When the outdoor temperature is equal to or less than this temperature, the IPU board will prevent the compressors from operating.
Minimum OA flow setpoint	This parameter is programmed through the SETPOINTS key. When air measurement stations are installed and the unit is not in the Occupied mode, this is the minimum allowable airflow.
MX supply air temp	This parameter is programmed through the SETPOINTS key. This becomes the Active Supply Air Temperature Setpoint for a FlexSys unit when it is in the Occupied Cooling Without Bypass mode.
Furnace 1A mode aprx rate	This is the approximate firing rate of the modulating gas heat section in MBH.
Furnace 1A MODE RELATIVE	This is the output from the IPU board to the modulating gas heat section in percent of full capacity.

Table 52: Definitions

Menu item	Definition
Morning warm up	This parameter is programmed through the PROGRAM key. This tells the IPU board if the Morning Warmup option is available or not. When it is programmed to USER ENABLED, Morning Warm Up is available to be used. When it is programmed to USER DISABLED, Morning Warm Up is unavailable.
Morning warm up max time	This parameter is programmed through the SETPOINTS key. This value is the maximum time the IPU board will allow for Morning Warm Up when the unit is in the Adaptive Morning Warm Up mode. If the derived Morning Warm Up Opt Time exceed this time the Morning Warm Up Max Time is used.
Morning warm up opt time	This is the average of the previous three days Warm Up times plus 10 minutes. This value is used to determine the Morning Warm Up start time for the next day when the unit is in the Adaptive Morning Warm Up mode.
Night set back	This parameter is programmed through the PROGRAM key. This parameter allows the user to enable or disable Night Set Back. If this parameter is disabled Unoccupied Heating will not be available. The two parameters to choose from are USER ENABLED or USER DISABLED.
OA damper maximum position	This parameter is programmed through the SETPOINTS key. This establishes the maximum amount of ventilation air to be used in a Demand Ventilation situation.
OA damper minimum position	This parameter is programmed through the SETPOINTS key. This establishes the minimum amount of ventilation air to be used when the unit is in the Occupied mode.
OA damper position active SP	This is the damper position setpoint, in percent open, the IPU board is trying to maintain.
OA damper position current	This is the actual output, in percent open to the outdoor air damper.
Outside air enthalpy	This indicates the total heat content of the outdoor air.
Outside air humidity	This is the outdoor air relative humidity.
Outside air temp	This is the outdoor air dry bulb temperature.
OAT setpoint for high SAT	This parameter is programmed through the SETPOINTS key. When the outdoor temperature is equal to or less than this temperature the Active Supply Air Temperature Setpoint on a Variable Air Volume Unit is set to the SAT HIGH SETPOINT.
OAT setpoint for low SAT	This parameter is programmed through the SETPOINTS key. When the outdoor temperature is equal to or greater than this temperature the Active Supply Air Temperature Setpoint on a Variable Air Volume Unit is set to the SAT LOW SETPOINT.
Outside air enthalpy setpoint	This parameter is programmed through the SETPOINTS key and is the upper limit of outdoor enthalpy that can be used for economizer operation. If the outdoor air enthalpy is above this value, the economizer is made inactive.
Outside air flow active SP	This is the airflow setpoint that the IPU board is trying to maintain.
Outside air maximum flow	This parameter is programmed through the SETPOINTS key. When air measurement stations are installed and the unit is in the Demand Ventilation mode, this is the maximum allowable airflow value.
Outside air minimum flow	This parameter is programmed through the SETPOINTS key. When air measurement stations are installed and the unit is in the Demand Ventilation mode, this is the minimum airflow value.
Power exhaust type	This parameter is programmed through the OPTIONS key and tells the IPU board what type of Exhaust is installed. The choices are None, On-Off Damper Cntrl, On-Off Press Cntrl, Modulate Damper VFD, Return Fan W/Exh, or Return Fan W/O Exh.
Press trans pkg	This parameter is programmed through the OPTIONS key. This identifies to the IPU board which of the compressor systems are configured with suction and discharge pressure transducers. The options are None, Sys 1; Sys 1, 2; or Sys 1, 2 and 3.
Pressure discharge*	This is the discharge pressure and is shown for each compressor system if pressure transducers are installed and configured for the system.
Pressure suction*	This is the suction pressure and is shown for each compressor system if pressure transducers are installed and configured for the system.

Table 52: Definitions

Menu item	Definition
Pumpdown	This parameter is programmed through the PROGRAM key. If Pumpdown is USER ENABLED at the end of the compressor system cycle the solenoid value to the expansion vales will close and the compressor will continue to operate for 30 seconds or until the low pressure cutout opens. This removes the refrigerant from the low side of the system. The choices are USER ENABLED or USER DISABLED. If Pumpdown is ENABLED all compressor system will use Pumpdown.
Return air enthalpy	This is the total heat content of the return air.
Return air humidity	This is the return air relative humidity.
Return air temp	This is the return air dry bulb temperature.
Return air temp current	This is the temperature of the return air entering the unit.
RAT heating setpoint	On a VAV or FlexSys unit, the IPU board monitors the RAT HEATING SETPOINT. When the return air temperature is 0.5 °F below this value the control switches into the Occupied Heating mode.
RAT cooling setpoint	On a VAV or FlexSys unit, the IPU board monitors the RAT COOLING SETPOINT. When the return air temperature is 0.5 °F above this value the control switches into the Occupied Cooling mode.
RAT setpoint for high SAT	This parameter is programmed through the SETPOINTS key. When the Return Air Temperature is equal to or LESS than this temperature the Active Supply Air Temperature Setpoint on a Variable Air Volume Unit is set to the SAT HIGH SETPOINT.
RAT setpoint for low SAT	This parameter is programmed through the SETPOINTS key. When the Return Air Temperature is equal to or greater than this temperature the Active Supply Air Temperature Setpoint on a Variable Air Volume Unit is set to the SAT LOW SETPOINT.
Ready to run comp A	This means the minimum OFF time has been achieved and all the safety circuits are closed and compressor A of the system is ready to be energized. The User Interface will display either YES or NO.
Ready to run comp B	This means the minimum OFF time has been achieved and all the safety circuits are closed and compressor B of the system is ready to be energized. The User Interface will display either YES or NO
Ready to stop comp A	This means the minimum ON time has been achieved and compressor A of the system is ready to be de-energized. The User Interface will display either YES or NO.
Ready to stop comp B	This means the minimum ON time has been achieved and compressor B of the system is ready to be de-energized. The User Interface will display either YES or NO.
Refrigerant type	This parameter is programmed through the OPTIONS key and identifies the type of refrigerant in the unit.
Return air bypass active SP	This is the position of the bypass damper by percent open the IPU board uses as the bypass setpoint on a FlexSys unit.
Return air bypass current	This is the position of the by-pass damper by percent open the IPU board uses as the Active Bypass percent setpoint on a FlexSys unit.
Return fan pressure active SP	This is the current mixed air chamber pressure that the IPU board is trying to maintain.
Return fan press current	This is the actual pressure in the mixed air chamber of the unit.
Return fan output	This is the Binary output from the IPU board to the Return Fan control system.
Return fan status	This is a Binary input into the IPU board that identifies the Return Fan is functioning.
Safety input LPCO	This is the Binary input to the IPU board from the Low Pressure Cutout safety circuit. ON means the safety circuit is normal and FAULTED means it has faulted. This parameter is shown for each compressor system.
Safety input chain	This is the Binary input to the IPU board from the Compressor Safety Circuit Chain. This includes the high pressure cutout, compressor motor protector, and the external overload or circuit breaker. ON means the safety circuit is normal and FAULTED means it has faulted. This parameter is shown for each compressor system.
SAT reset method	This parameter is programmed through the OPTIONS key and identifies the Supply Air Temperature reset method being used on a Variable Air Volume Unit. The choices are Hardwired, Outside Air, Return Air, or Supply Fan Speed.

Table 52: Definitions

Menu item	Definition
SAT high setpoint	This parameter is programmed through the SETPOINTS key. This establishes the maximum Active Supply Air Temperature to be used in a Variable Air Volume Unit.
SAT low setpoint	This parameter is programmed through the SETPOINTS key. This establishes the minimum Active Supply Air Temperature to be used in a Variable Air Volume Unit.
Sensor / misc status	This is the current status of the Sensors. The display will show Normal, Warning, Safety Trip, Safety Fault, or Safety Lockout.
Single zone minimum VAV speed	This parameter provides the minimum speed of the Supple Fan during SZVAV operation.
Smoke purge SEQ 1	This parameter is programmed through the OPTIONS key. This allows the user to select which of the three smoke purge sequences to use a sequence 1, Purge, Pressurization, or Evacuation. Smoke Purge Sequence 1 is energized through a Binary input to the IPU board.
Smoke purge SEQ 2	This parameter is programmed through the OPTIONS key. This allows the user to select which of the three smoke purge sequences to use a sequence 2, Purge, Pressurization, or Evacuation. Smoke Purge Sequence 2 is energized through a Binary input to the IPU board.
Smoke purge SEQ 3	This parameter is programmed through the OPTIONS key. This allows the user to select which of the three smoke purge sequences to use a sequence 3, Purge, Pressurization, or Evacuation. Smoke Purge Sequence 3 is energized through a Binary input to the IPU board.
1st stage cooling setpoint	This parameter is programmed through the SETPOINTS key. This value is used in a Constant Volumn unit as the Active SAT Setpoint for 1st Stage cooling operation.
1st stage heating setpoint	This parameter is programmed through the SETPOINTS key. This value is used in a Constant Volumn unit as the Active SAT Setpoint for 1st Stage heating operation.
2nd stage 2 cooling setpoint	This parameter is programmed through the SETPOINTS key. This value is used in a Constant Volumn unit as the Active SAT Setpoint for 2nd Stage cooling operation.
2nd stage 2 heating setpoint	This parameter is programmed through the SETPOINTS key. This value is used in a Constant Volumn unit as the Active SAT Setpoint for 2nd Stage heating operation.
Staged heat status stgs on	This identifies the number of stages of gas or electric heat that the IPU board has energized.
Staged heat status stgs avail	This identifies the number of stages of gas or electric heat that are available.
Suction temp	This is the temperature of the suction line leaving the evaporator coil and is shown for each system. This value is monitored and used to prevent liquid refrigerant from being returned to the compressor.
SUP air tempering	This parameter is programmed through the PROGRAM key. This parameter is used to allow the heat to operate when the unit is in the Occupied Standby mode to temper the ventilation air entering the space. The choices are USER ENABLED or USER DISABLED.
Supply air temp active SP	This is the Supply Air Temperature the IPU board is trying to maintain.
Supply air temp current	This is the current Supply Air Temperature supplied by the unit.
Supply fan output	This is the Binary output from the IPU board to the Supply Fan control system.
Supply fan output proof	This is a Binary input into the IPU board that identifies the Supply Fan is functioning.
Supply fan VFD speed	This indicates the output, in percent, to the Supply Fan VFD.
Supply sys status	This is the active status of the Supply System, display will show Normal- Active; Normal-Inactive; Safety Trip, Safety Fault, or Safety Lockout.
System unloading pressure	This parameter is programmed through the SETPOINTS key. If two compressors of the system are operative and the discharge pressure is equal to or greater than this value the IPU board will turn off one of the compressors. This feature is only operative when a discharge pressure transducer is installed in the compressor system.
Temperature superheat	This is calculated for each compressor system that has a suction line pressure transducer installed and configured. This is the refrigerant evaporator superheat leaving the evaporator coil.
Underfloor air humidity	This is the humidity level under the floor of a FlexSys installation.
Underfloor air temp	This is the temperature of the air in the underfloor space.

Table 52: Definitions

Menu item	Definition
Underfloor slab dew point	This is the dewpoint of the air beneath the floor of a FlexSys installation.
Underfloor slab temp	This is the temperature of the slab beneath the floor of a FlexSys installation.
Unit installed altitude	This parameter is programmed through the SETPOINTS key. This is the altitude at which the unit is installed. This is used in the calculation of an airflow correction factory when air measuring stations are installed.
Unit size	This parameter is programmed through the OPTIONS key and identifies the size of the unit.
Unit type	This parameter is programmed through the OPTIONS key and identifies the type of unit. The choices are Constant Volume, Variable Volume, or FlexSys.
Unit-overall status	This is the active status of the Unit. The display will show Local Stop, Run, Unit Trip, Unit Fault, Unit Lockout, SMK Purge # - Press, SMK Purge #-Purge, or Smk Purge #-Evac.
Vent sys status	This is the active status of the Ventilation System. The display will show Normal-Active, Normal-Inactive, Safety Trip, Safety Fault, Safety Lockout, User Disabled, or None.
Ventilation control	This parameter is programmed through the OPTIONS key and identifies whether the unit will operate with a Fixed Minimum or Demand ventilation system.
Ventilation demand	This is the output in percent to the outside air damper when the unit is operating in the Demand Ventilation mode.
Zone temp occ zone cooling setpoint	This parameter is programmed using the SETPOINTS key. This is the temperature that the IPU board compares the actual space temperature to, to decide when to switch into the Occupied Cooling Mode.
Zone temp occ zone heating setpoint	This parameter is programmed using the SETPOINTS key. This is the temperature that the IPU board compares the actual space temperature to, to decide when to switch into the Occupied Heating Mode.
Zone temp unocc zone cooling setpoint	This parameter is programmed using the Setpoints key. This is the temperature that the IPU board compares the actual space temperature to, to decide when to switch into the Unoccupied Cooling Mode.
Zone temp unocc zone heating setpoint	This parameter is programmed using the Setpoints key. This is the temperature that the IPU board compares the actual space temperature to, to decide when to switch into the Unoccupied Heating Mode.
Zone temp current	This is the temperature in the conditioned space.

ⓘ **Note:** * May be 1, 2, or 3.

Service

Analog input operation

This section describes the control operation of the 29 analog inputs. These inputs are used by the control to monitor and respond to unit temperatures, pressures, enthalpy, etc. The location of each of these connections on the IPU board is contained in Table 49. Notice that the ID gives the jack connection designated as “J” and then the identifying number of the connector, followed by a– and then the pin number of the connector. For example, the SUPPLY AIR TEMPERATURE analog input would be found at J1-1. This is connector J1–Pin 1. As the IPU board board is positioned in the control box the top row of the J series connectors is the input, the middle row is the common, and the bottom row is the 5VDC input to the sensor. Also the pin in the right hand top corner is pin 1.

Temperature sensors

The temperature sensors are all 10K Type III Thermistors. The relationship between the temperature and the voltage output and resistance is contained in Table 53. The following analog input are of this type: Supply Air Temperature, Heat Entering Temp, Outside Air Temp, Return Air Temp, Suction Temp #1, Suction Temp #2, Suction Temp #3, and Zone Temp.

Duct pressure transducer

The duct pressure transducer is located in the return air section of the unit. The purpose of the transducer is to sense and convert the static pressure in the supply-side of the duct to a 0 to 5 VDC voltage. The DC voltage is sent to the IPU board and compared against the duct static press active setpoint. The transducer is factory wired, but pneumatic tubing must be field supplied and installed (refer to Position damper). The duct static pressure transducer measures differential pressure between the pressure in the duct and atmospheric pressure. When verifying transducer operation, the technician must insert a tee in the pneumatic tubing and connect a manometer to the tee to verify the pressure being applied to the transducer. Once this pressure is known, a comparison can be made of the duct pressure vs. output VDC from the transducer. Table 54 shows the relationship between the pressure applied to the duct pressure transducer and the output voltage. The output is linear between 0 in. w.c. and the SPAN. The *DUCT PRESS TRANSDUCER SPAN* can be set to 1.25, 2.5, or 5 in. w.c.

Table 53: Temperature sensor resistance

°F	Voltage	Resistance	°C
-25	0.49	139,639	-30.6
-20	0.53	127,453	-28.9
-15	0.60	109,624	-26.1
-10	0.69	94,519	-23.34
-5	0.78	81,665	-20.55
0.0	0.88	70,750	-17.78
5	0.98	61,418	-15.00
10	1.10	53,426	-12.22
15	1.22	46,582	-9.44
20	1.35	40,703	-6.67
25	1.48	35,639	-3.89
30	1.62	31,269	-1.11
35	1.77	27,490	1.67
40	1.91	24,219	4.44
45	2.06	21,377	7.22
50	2.21	18,900	10.00
55	2.36	16,744	12.78
60	2.51	14,681	15.56
65	2.66	13,216	18.33

Table 53: Temperature sensor resistance

°F	Voltage	Resistance	°C
70	2.80	11,771	21.11
75	2.94	10,502	23.89
80	3.08	9,388	26.67
85	3.21	8,404	29.45
90	3.33	7,537	32.22
95	3.45	6,770	35.0
100	3.56	6,090	37.78
105	3.66	5,487	40.56
110	3.76	4,951	43.34
115	3.85	4,475	46.11
120	3.94	4,050	48.89
125	4.02	3,671	51.66
130	4.09	3,332	54.44
135	4.16	3,029	57.22

Table 54: Duct pressure transducer

1.25 in. w.c. span differential input press	2.5 in. w.c. span differential input press	5.0 in. w.c. span differential input press	Voltage VDC
0.125	0.25	0.5	0.50
0.25	0.50	1.0	1.00
0.375	0.75	1.50	1.50
0.50	1.00	2.00	2.00
0.625	1.25	2.50	2.50
0.75	1.50	3.00	3.00
0.875	1.75	3.50	3.50
1.00	2.00	4.00	4.00
1.125	2.25	4.50	4.50
1.25	2.50	5.00	5.00

Building pressure transducer

The building pressure transducer is located in the return air section of the unit. The purpose of the transducer is to sense and convert the static pressure in the building to a 0 to 5 VDC voltage. The DC voltage is then sent to the IPU board and compared against the *BUILDING PRESSURE ACTIVE SETPOINT.* The transducer is factory wired, but pneumatic tubing must be field supplied and installed (refer to Installation). The building pressure transducer measures differential pressure in the building and atmospheric pressure. When verifying transducer operation, the technician can insert a tee into the pneumatic tubing and connect a manometer to the tee to verify the pressure being applied to the transducer. When this pressure is known, a comparison can be made of the building pressure vs. output VDC from the transducer. A practical and quick check of this transducer can also be accomplished by removing the pneumatic tubing lines from both the low and high side connections on the transducer. Because both of the inputs will now be exposed to the same pressure, the differential pressure is zero, and the output 2.5 VDC according to Table 55.

Return fan pressure transducer

If the unit is ordered with the return fan option, the unit has a return fan pressure transducer. The transducer is mounted in the return compartment and compares the pressure in the return air compartment to atmospheric pressure. The IPU board varies the speed of the return fan in order to maintain the correct differential pressure in the return compartment. When verifying transducer operation, the technician can insert a tee into the pneumatic tubing and connect a manometer to the tee to verify the pressure being applied to the transducer. When this pressure is known, a comparison can be made of the return compartment pressure vs. output VDC from the transducer.

A practical and quick check of this transducer can also be accomplished by removing the pneumatic tubing lines from both the low and high side connections on the transducer. Because both of the inputs will now be exposed to the same pressure, the differential pressure is zero, and the output 2.5 VDC according to Table 56.

Table 55: Building pressure transducer output

Differential input pressure (in. w.c.)	Output voltage (VDC)
-0.50	0.00
-0.40	0.50
-0.30	1.00
-0.20	1.50
-0.10	2.00
0.00	2.50
0.10	3.00
0.20	3.50
0.30	4.00
0.40	4.50
0.50	5.00

Table 56: Return fan pressure transducer output

Differential input pressure (in. w.c.)	Output voltage (VDC)
-1.00	0.00
-0.80	0.50
-0.60	1.00
-0.40	1.50
-0.20	2.00
0.00	2.50
0.20	3.00
0.40	3.50
0.60	4.00
0.80	4.50
1.00	5.00

Discharge pressure transducer

The discharge pressure transducer is located in the common discharge line of the tandem compressors for each refrigerant circuit. The purpose of this transducer is to sense and convert the discharge pressure into a DC voltage. The DC voltage is then sent to the IPU board where it is used to control the number of condenser fan when the unit is in cooling operation. The discharge pressure value, in PSIG, is displayed by the user interface.

The discharge transducer has a range of 0 to 500 PSIG, with a linear output of 0 to 5 VDC. Table 57 illustrates the DC volt output from the transducer for a given discharge pressure.

Suction pressure transducer

The optional suction pressure transducer is located in the common suction line of the tandem compressors for each refrigerant circuit. The purpose of the transducer is to sense and convert the

suction pressure to a DC voltage. The DC voltage is then sent to the IPU board where it is displayed by the user interface. When this option is installed the IPU board will also calculate and display the evaporator superheat value for the system.

The suction transducer has a range of 0 to 200 PSIG, with a linear output of 0 to 5 VDC. Table 57 illustrates the DC volt output from the transducer for a given suction pressure.

Table 57: Pressure transducers

Suction transducer		Discharge transducer	
Pressure PSIG	**Voltage VDC**	**Pressure PSIG**	**Voltage VDC**
0	0.50	0	0.50
25	1.00	50	1.00
50	1.50	100	1.50
75	2.00	150	2.00
100	2.50	200	2.50
125	3.00	250	3.00
150	3.50	300	3.50
175	4.00	350	4.00
200	4.50	400	4.50

Humidity sensors

The humidity sensor outputs a 0 to 5VDC in response to the relative humidity sensed. An outdoor air humidity sensor is used whenever the economizer is configured for single or dual enthalpy. A return air humidity sensor is used whenever the economizer is configured for dual enthalpy. A humidity sensor is also used to monitor the humidity in the space between the slab and raised floor system used for FlexSys applications. Table 58 gives the relationship between the voltage output of the humidity sensor and the % relative humidity.

CO_2 sensor

Two CO_2 sensors are used in conjunction with the *DEMAND VENTILATION* option. In *DEMAND VENTILATION*, the IPU board monitors the CO_2 level of the outdoor air and the CO_2 level in the conditioned space and varies the amount of ventilation air based on the relationship between these two values. Table 59 gives the volts DC output for a given CO_2 level.

Furnace status input

The IPU board monitors the operation of the staged and modulating gas heat sections and displays the status through the STATUS screen of the user interface. The operation of each of the gas heat sections is monitored by a multiplexer installed in the gas heat section. When a gas heat section is energized, it sends a 24 V signal to the multiplexer. The multiplexer takes the five on and off inputs and converts them into a 0 to 5 VDC signal that is sent to the IPU board. The IPU board then decodes this analog input and displays the furnace section status. Table 60 and Table 61show the relationship between the DC voltage and the furnace operation status.

Table 58: Humidity sensor outputs

% Relative humidity	Output voltage VDC	% Relative humidity	Output voltage VDC
5	0.25	55	2.75
10	0.50	60	3.00
15	0.75	65	3.25
20	1.00	70	3.50
25	1.25	75	3.75
30	1.50	80	4.00

Table 58: Humidity sensor outputs

% Relative humidity	Output voltage VDC	% Relative humidity	Output voltage VDC
35	1.75	85	4.25
40	2.00	90	4.50
45	2.25	95	4.75
50	2.50	100	5.00

Table 59: CO_2 sensor output

PPM CO_2	Output voltage VDC	PPM CO_2	Output voltage VDC
80	0.20	1120	2.80
160	0.40	1200	3.00
240	0.60	1280	3.20
320	0.80	1360	3.40
400	1.00	1440	3.60
480	1.20	1520	3.80
560	1.40	1600	4.00
640	1.60	1680	4.20
720	1.80	1760	4.40
800	2.00	1840	4.60
880	2.20	1920	4.80
960	2.40	2000	5.00
1040	2.60		

Table 60: Furnace status input modulating gas heat

Min volts DC	Max volts DC	Modulating furnace 1A status	Furnace 1A high status	Furnace 2 status	Furnace 3 status	Furnace 1B status
0.086	0.166	OFF	OFF	OFF	OFF	OFF
0.224	0.313	ON	OFF	OFF	OFF	OFF
0.361	0.461	OFF	ON	OFF	OFF	OFF
0.499	0.609	ON	ON	OFF	OFF	OFF
0.637	0.756	OFF	OFF	ON	OFF	OFF
0.774	0.904	ON	OFF	ON	OFF	OFF
0.912	1.051	OFF	ON	ON	OFF	OFF
1.050	1.199	ON	ON	ON	OFF	OFF
1.187	1.346	OFF	OFF	OFF	ON	OFF
1.325	1.494	ON	OFF	OFF	ON	OFF
1.463	1.641	OFF	ON	OFF	ON	OFF
1.600	1.789	ON	ON	OFF	ON	OFF
1.738	1.936	OFF	OFF	ON	ON	OFF
1.876	2.084	ON	OFF	ON	ON	OFF
2.013	2.231	OFF	ON	ON	ON	OFF
2.151	2.379	ON	ON	ON	ON	OFF
2.289	2.526	OFF	OFF	OFF	OFF	ON
2.426	2.674	ON	OFF	OFF	OFF	ON
2.564	2.821	OFF	ON	OFF	OFF	ON
2.702	2.969	ON	ON	OFF	OFF	ON
2.839	3.116	OFF	OFF	ON	OFF	ON
2.977	3.264	ON	OFF	ON	OFF	ON
3.115	3.411	OFF	ON	ON	OFF	ON
3.252	3.559	ON	ON	ON	OFF	ON
3.390	3.706	OFF	OFF	OFF	ON	ON
3.528	3.854	ON	OFF	OFF	ON	ON
3.665	4.001	OFF	ON	OFF	ON	ON
3.803	4.149	ON	ON	OFF	ON	ON

Table 60: Furnace status input modulating gas heat

Min volts DC	Max volts DC	Modulating furnace 1A status	Furnace 1A high status	Furnace 2 status	Furnace 3 status	Furnace 1B status
3.941	4.296	OFF	OFF	ON	ON	ON
4.078	4.444	ON	OFF	ON	ON	ON
4.216	4.592	OFF	ON	ON	ON	ON
4.354	4.739	ON	ON	ON	ON	ON

Table 61: Furnace status input staged gas heat

Min volts DC	Max volts DC	Furnace 1 status	Furnace 2 status	Furnace 3 status
0.086	0.166	OFF	OFF	OFF
0.224	0.313	ON	OFF	OFF
0.361	0.461	OFF	ON	OFF
0.499	0.609	ON	ON	OFF
0.637	0.756	OFF	OFF	ON
0.774	0.904	ON	OFF	ON
0.912	1.051	OFF	ON	ON
1.050	1.199	ON	ON	ON

Faults

A fault is defined as an abnormal condition, which results in the shutdown of an operating system or the complete unit. The presence of a fault condition indicates a situation in which possible damage to the unit may occur if the unit or system were allowed to continue to operate. There are four types of faults.

- Unit lockout – The complete unit is shutdown and locked out. A manual reset is required to restart the unit after the fault has been corrected.
- System lockout – One of the compressor systems or other component is shutdown and locked out. A manual reset is required to restart the system after the fault has been corrected.
- Unit auto reset – The complete unit is shutdown but the unit will restart automatically when the fault condition is cleared.
- System auto reset – One of the compressor systems or other component is shut down but the system or component will restart automatically when the fault condition is cleared.

A UNIT LOCKOUT can be reset by turning the LOCAL STOP switch OFF for 5 seconds and then back ON. If the cause of the lockout has been corrected the unit will reset and begin proper operation.

A SYSTEM LOCKOUT except for COMPR # LOCKOUT and COMPR # LPCO SAFETY LOCKOUT can be reset by turning the LOCAL STOP switch OFF for 5 seconds and then back ON. A COMPR # LOCKOUT and COMPR # LPCO SAFETY LOCKOUT must be reset by entering the OPTIONS key and the COMPRESSOR SYSTEMS # subsection, which has the lockout. Then use the up and down arrow key to go to COMP SYS # STATUS. The current status is LOCKOUT. Press the check key (√) and use the right arrow key to change LOCKOUT to RUN.

In addition to faults the User Interface will also display warnings. A warning is defined as an abnormal condition under which the unit continues to operate. Warnings will not require the unit to shut down; however, they may require the IPU board to disable certain functions that may result in the unit operating less efficiently or eliminate certain features.

Table 65 lists the faults and warnings that are displayed under the STATUS and HISTORY keys of the user interface. When a fault is present line two of the effected STATUS screen display (UNIT-OVERALL STATUS, COMPRESSOR SYSTEM 1, COMPRESSOR SYSTEM 2, COMPRESSOR SYSTEM 3, HEATING SYSTEM, ECONOMIZER SYSTEM, SUPPLY SYSTEM, EXHAUST SYSTEM, VENTILATION

SYSTEM, or SENSOR / MISC STATUS) will change nomenclature to indicate a WARNING, SAFETY TRIP, SAFETY FAULT, or SAFETY LOCKOUT is present. A fault / warning description, method of reset and conditions under which the information is displayed is also contained in the table. Additional information for each of the faults is contained under their respective segment of Sequence of operation located in this IOM.

When a fault is declared, the IPU board will record the time of occurrence, the date of occurrence, and a complete unit snapshot at the time of each occurrence in the HISTORY buffer. This data can be retrieved using the HISTORY key of the User Interface.

The HISTORY buffer stores the data from the last ten faults from the most recent (HISTORY 01) to the oldest (HISTORY 10). No fault HISTORY is eliminated once recorded other than being "pushed off" of the end of the list by a new fault when the buffer becomes full.

Warnings are only displayed in the HISTORY buffer while they are active. When the problem that generated the WARNING is corrected the record is removed from the buffer. The IPU board does not record the time of occurrence, the date of occurrence, or a complete unit snapshot at the time of occurrence for a WARNING.

The HISTORY buffer is password protected and a level 2 password must be entered in order to view the data.

When the HISTORY key is pressed, the password prompt will appear. After the proper level 2 password has been entered the screen will show the first active warning. If there are no active warnings present, the first fault is displayed. If there are no faults in the HISTORY buffer, the screen will display NO FAULT. For menu navigation and display description, see History for additional information on how to navigate through the HISTORY menu.

In addition to the items listed in Table 65, the following items listed below are contained under the HISTORY key.

COMPRESSOR SYSTEM (1,2, or 3) CLEAR - Whenever there is a compressor safety trip the IPU board initiates the compressor status clear time (1,2, or 3) timer. The IPU board records the time it takes for the trip to clear. When the fault clears *COMPRESSOR SYSTEM (1,2, or 3) CLEAR* shows the time it took for the fault to clear in the history buffer.

COMPRESSOR SYSTEM (1,2, or 3) TIME OUT – If the compressor status clear time (1,2, or 3) timer reaches 60 minutes a *COMPRESSOR SYSTEM (1,2, or 3) TIME OUT* is indicated in the history buffer. In most cases this indicates the compressor circuit over current protector opened. The compressor circuit over current protector is a manual reset device and the circuit would not reset in the required 60 minute time frame. The status key will display the message *COMP SYS (1,2, or 3) STATUS SAFETY LOCKOUT*. The IPU board locks out the corresponding compressor system when a *COMPRESSOR SYSTEM (1,2, or 3) TIME OUT* is declared.

COMPR SYSTEM (1,2, or 3) INHIBIT – This WARNING indicates the compressor system safety circuit experienced a trip but reset prior to the exploration of the 60 minute reset time function. If the safety circuit does not reset in 60 minutes it is replaced with a *COMPRESSOR SYSTEM (1,2, or 3)TIME OUT* message.

Figure 63: I/O Control board

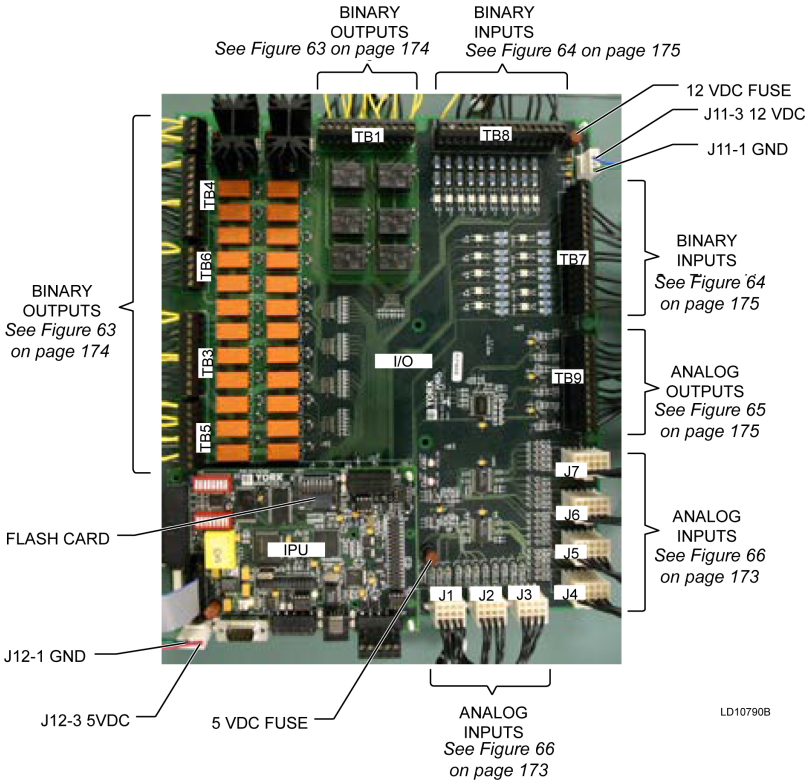


Figure 64: I/O Control board - binary outputs

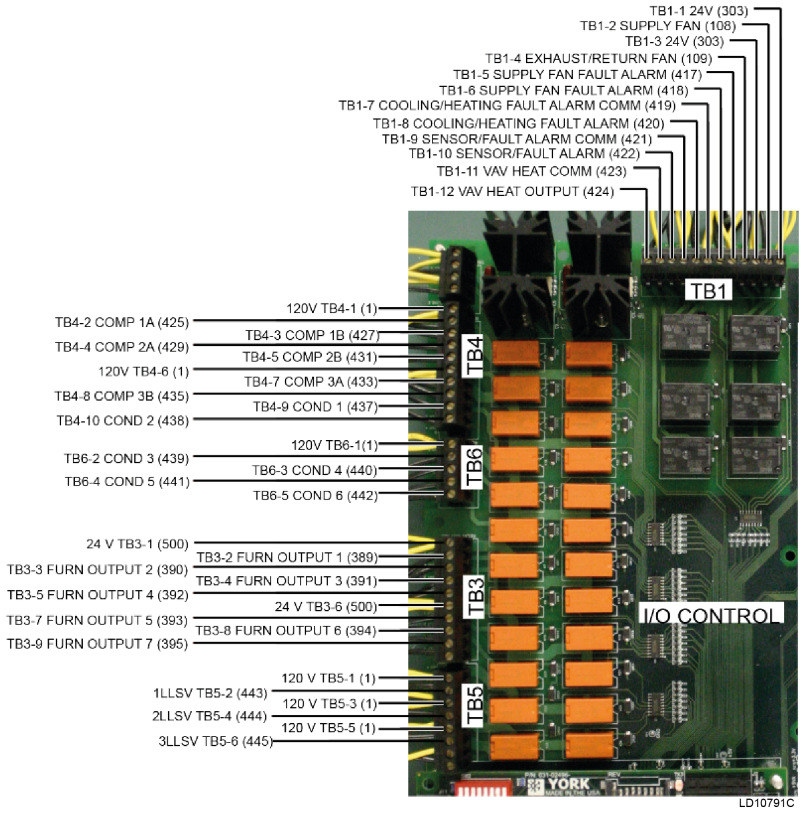


Figure 65: I/O Control board - binary inputs

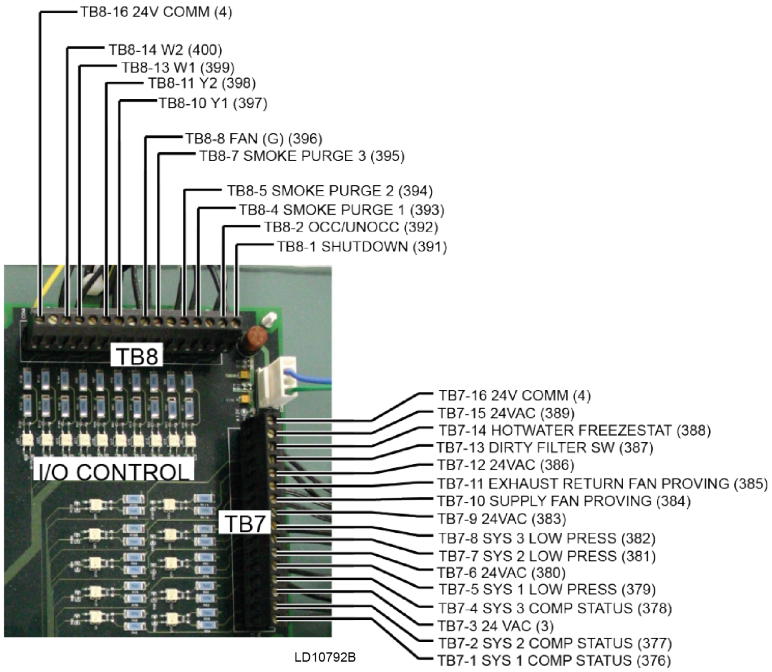


Figure 66: I/O Control board - analog outputs

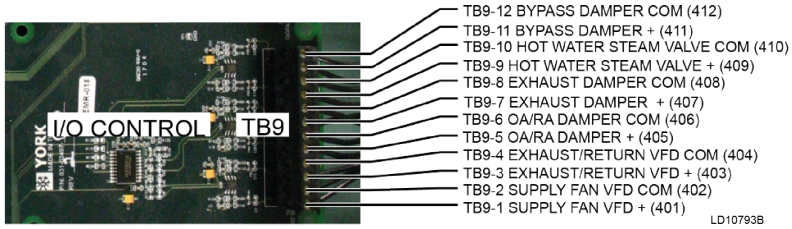
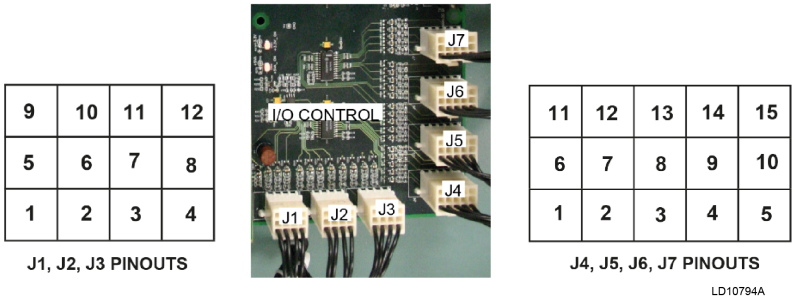


Figure 67: I/O Control board - analog inputs



Note: See Table 62 for pinouts

Table 62: I/O Control board - analog input pinouts

Pin number	Signal
J1-1	Input Supply Air Temp (308)
J1-5	Shield Supply Air Temp
J1-9	Ref Supply Air Temp 5VDC (309)
J1-2	Input Heat Enter Temp (310)

Table 62: I/O Control board - analog input pinouts

Pin number	Signal
J1-6	Shield Heat Enter Temp
J1-10	Ref Heat Enter Temp 5VDC (311)
J1-3	Input Flex Evap Temp (312)
J1-7	Shield Flex Evap Temp
J1-11	Ref Flex Evap Temp 5VDC (313)
J2-1	Input Outside Air Temp (314)
J2-5	Shield Outside Air Temp
J2-9	Ref Outside Air Temp 5VDC (315)
J2-2	Input Return Air Temp (316)
J2-6	Shield Return Air Temp
J2-10	Ref Return Air Temp 5VDC (317)
J2-3	Input OA Hum (318)
J2-7	Com OA Hum (319)
J2-4	Input RA Hum (320)
J2-8	Com RA Hum (321)
J3-1	Input Suct Temp Sys1 (322)
J3-5	Shield Suct Temp Sys1
J3-9	Ref Suct Temp Sys1 5VDC (323)
J3-2	Input Suct Temp Sys2 (324)
J3-6	Shield Suct Temp Sys2
J3-10	Ref Suct Temp Sys2 5VDC (325)
J3-3	Input Suct Temp Sys3 (326)
J3-7	Shield Suct Temp Sys3
J3-11	Ref Suct Temp Sys3 5VDC (327)
J3-4	Input Suct Press Sys1 (328)
J3-8	Com Suct Press Sys1 (329)
J3-12	Ref Suct Press Sys1 5VDC (330)
J4-1	Input Suct Press Sys2 (331)
J4-6	Com Suct Press Sys2 (332)
J4-11	Ref Suct Press Sys2 5VDC (333)
J4-2	Input Suct Press Sys3 (334)
J4-7	Com Suct Press Sys3 (335)
J4-12	Ref Suct Press Sys3 5VDC (336)
J4-3	Input Disch Press Sys1 (337)
J4-8	Com Disch Press Sys1 (338)
J4-13	Ref Disch Press Sys1 5VDC (339)
J4-4	Input Disch Press Sys2 (340)
J4-9	Com Disch Press Sys2 (341)
J4-14	Ref Disch Press Sys2 5VDC (342)
J4-5	Input Disch Press Sys3 (343)
J4-10	Com Disch Press Sys3 (344)
J4-15	Ref Disch Press Sys3 5VDC (345)
J5-1	Input Gas Heat Status (542)
J5-6	Com Gas Heat Status (543)
J5-11	Ref Gas Heat Status 5VDC (541)
J5-2	Input OA Co2 (348)
J5-7	Com OA Co2 (349)
J5-3	Input RA Co2 (350)
J5-8	Com RA Co2 (351)
J6-1	Input Return Fan Press (352)
J6-6	Com Return Fan Press (353)
J6-2	Input Duct Press (354)
J6-7	Com Duct Press (355)

Table 62: I/O Control board - analog input pinouts

Pin number	Signal
J6-3	Input Bldg Press (356)
J6-8	Com Bldg Press (357)
J6-4	Input OA Air Press 1 (358)
J6-9	Com OA Air Press 1 (359)
J6-5	Input OA Air Press 2 (360)
J6-10	Com OA Air Press 2 (361)
J7-1	Input Zone Temp Sensor (363)
J7-6	Shield Zone Temp Sensor (364)
J7-11	Ref Zone Temp Sensor 5VDC (362)
J7-2	Input FlexSys Slab Sensor (366)
J7-7	Shield FlexSys Slab Sensor (367)
J7-12	Ref FlexSys Slab Sensor 5VDC (365)
J7-3	Input FlexSys Under Floor Hum (368)
J7-8	Com FlexSys Under Floor Hum (369)
J7-4	Input Sat Reset (371)
J7-9	Com Sat Reset (372)
J7-14	Ref Sat Reset 5VDC (370)
J7-5	Input Duct Static Reset (374)
J7-10	Com Duct Static Reset (375)
J7-15	Ref Duct Static Reset 5VDC (373)

Table 63: Warning descriptions

Warning text	Fault output	Description	Status screen message	Fault code
WRN-BLDG PRESS	SENSOR/MISC FAULT	Building static pressure is less than -0.45 in. w.c. or greater than 0.45 in. w.c. for 10 seconds.	EXH SYS STATUS: WARNING	31
WRN-CO2 SENSOR 1 OUTSIDE	SENSOR/MISC FAULT	OA CO_2 sensor is out of range for 15 minutes.	VENT SYS STATUS: WARNING	32
WRN-CO2 SENSOR 2 INSIDE	SENSOR/MISC FAULT	The inside CO_2 sensor is out of range for 15 minutes.	VENT SYS STATUS: WARNING	33
WRN-COMP SYS # INHIBIT	SENSOR/MISC FAULT	Compressor system number experienced a safety trip but reset before the 60 minute timer expired.	SENSOR/MISC STATUS: WARNING	35, 36, 37
WRN-DAMPER NOT MODULATING	SENSOR/MISC FAULT	Economizer fault detection is on and the OA damper is stuck open, is stuck at minimum, is defective, or is disconnected.	SENSOR/MISC STATUS: WARNING	38
WRN-DIRTY FILTER	SENSOR/MISC FAULT	Dirty filter switch is closed for 1 minute.	FILTER STATUS: CHANGE	39
WRN-DISCH PRS SENSOR #	SENSOR/MISC FAULT	Disch pressure for system number is out of range for 10 seconds.	SENSOR/MISC STATUS: WARNING	40, 41, 42
WRN-DUCT PRS XDCR	FAN FAULT	Supply fan status is running but the current duct static is less than a third of the active setpoint.	SUPPLY SYS STATUS: WARNING	43

Table 63: Warning descriptions

Warning text	Fault output	Description	Status screen message	Fault code
WRN-ECONO SENSOR FAULT	SENSOR/MISC FAULT	Economizer fault detection is on and the economy sensor is out of range.	SENSOR/MISC STATUS: WARNING	44
WRN-EXCESS ECONOMIZER	SENSOR/MISC FAULT	Economizer fault detection is on and the OA damper is stuck open, is defective, is disconnected, or there is an economizer sensor failure.	SENSOR/MISC STATUS: WARNING	45
WRN-EXCESS OUTSIDE AIR	SENSOR/MISC FAULT	Economizer fault detection is on and the OA damper is stuck open, is disconnected, or there is an economizer sensor failure.	SENSOR/MISC STATUS: WARNING	46
WRN-EXHAUST FAN	SENSOR/MISC FAULT	Exhaust fan outout is on and the status is still stopped after 45 seconds.	EXH SYS STATUS: WARNING	47
WRN-FREEZESTAT TRIP	COOL/HEAT FAULT	If the freezestat faults, this warning displays. If it stays faulted for 5 minutes, a lockout-hot water freeze occurs. If the fault clears during this 5 minutes, normal heating operation resumes.	SENSOR/MISC STATUS: WARNING	1
WRN-FURNACE MULTIPLEXER FAULT	COOL/HEAT FAULT	Mod gas heat only. The heat outputs do not match the furnace status inputs.	SENSOR/MISC STATUS: WARNING	2
WRN-GAS FURNACE	COOL/HEAT FAULT	Staged gas only. The heat outputs do not match the furnace status inputs.	SENSOR/MISC STATUS: WARNING	3
WRN-HET SENSOR	SENSOR/MISC FAULT	The heat entering temperature sensor is out of range for 10 seconds.	SENSOR/MISC STATUS: WARNING	48
WRN-HIGH DP UNLOAD #	SENSOR/MISC FAULT	Both comps are on for the system number and the disch press is greater than the system unloading press for 10 seconds.	SENSOR/MISC STATUS: WARNING	49, 50, 51, 52, 53, 54
WRN-LOW AMBIENT TEMP #	SENSOR/MISC FAULT	The OA temperature is less than the mech cooling lockout temperature.	COMP SYS # STATUS: LOW AMB INHIBIT	74, 75, 76

Table 63: Warning descriptions

Warning text	Fault output	Description	Status screen message	Fault code
WRN-LOW SUCTION TEMP	SENSOR/MISC FAULT	The suction temperature is less than the suction temperature low limit for 10 seconds.	COMP SYS # STATUS: TEMP UNLOADING # ON	55, 56, 57, 77, 78, 79
WRN-NOT ECONOMIZING	SENSOR/MISC FAULT	The OA damper is defective, is stuck at minimum, is disconnected, or the economy sensor has failed.	SENSOR/MISC STATUS: WARNING	58
WRN-OA DAMPER ACTUATOR STUCK	SENSOR/MISC FAULT	OA damper feedback is greater than 15% for 5 minutes.	SENSOR/MISC STATUS: WARNING	59
WRN-OA FLOW PRS 1	SENSOR/MISC FAULT	See Air Measurement Station faults in Sequence of operation.	SENSOR/MISC STATUS: WARNING	60
WRN-OA FLOW PRS 2	SENSOR/MISC FAULT	See Air Measurement Station faults in Sequence of operation.	SENSOR/MISC STATUS: WARNING	61
WRN-OA FLOW PRS AUTO-ZERO	SENSOR/MISC FAULT	The OA flow count is greater than 300 for 1 minute.	SENSOR/MISC STATUS: WARNING	62
WRN-OUTSIDE AIR RH	SENSOR/MISC FAULT	The OA temperature is greater than 32°F (0°C) for 10 seconds and the OA RH is less than 5% for 10 seconds.	SENSOR/MISC STATUS: WARNING	63
WRN-RA DAMPER ACTUATOR STUCK	SENSOR/MISC FAULT	RA damper feedback is greater than 15% for 5 minutes.	SENSOR/MISC STATUS: WARNING	64
WRN-RETURN AIR RH	SENSOR/MISC FAULT	RA temperature is greater than 32°F (0°C) for 10 seconds and the RA RH is less than 5% for 10 seconds.	SENSOR/MISC STATUS: WARNING	65
WRN-RETURN FAN PRS XDCR	FAN FAULT	SF output is on and the RF pressure is less than -0.95 in. w.c. or greater than 0.95 in. w.c. for 30 seconds or the SF output is off and the RF pressure is less than -0.1 in. w.c. or greater than 0.1 in. w.c. for 5 minutes.	SUPPLY SYS STATUS: WARNING	21
WRN-SLAB TEMP SENSOR	SENSOR/MISC FAULT	Underfloor slab temperature is out of range for 10 seconds.	SENSOR/MISC STATUS: WARNING	66

Table 63: Warning descriptions

Warning text	Fault output	Description	Status screen message	Fault code
WRN-SUCTION PRS SENSOR #	SENSOR/MISC FAULT	Suction pressure for system number is out of range for 10 seconds.	SENSOR/MISC STATUS: WARNING	67, 68, 69
WRN-SUCTION TEMP SENSOR #	SENSOR/MISC FAULT	Suction pressure for system number is out of range for 10 seconds.	SENSOR/MISC STATUS: WARNING	70, 71, 72
WRN-UNDERFLOOR RH SENSOR	SENSOR/MISC FAULT	Underfloor are RH is less than 5% for 5 minutes.	SENSOR/MISC STATUS: WARNING	73

Table 64: Auto reset

Fault text	Fault output	Description	Status screen message	Fault code
AUTO RESET-COMP SYS # CLEAR	-	Displays the time it took a compressor system safety trip to clear.	-	-
AUTO RESET-COMP SYS # TRIP 1	COOL/HEAT FAULT	Compressor system number safety chain opened. This is the first trip.	COMP SYS # SAFETY TRIP	14, 15, 16
AUTO RESET-COMP SYS # TRIP 2	COOL/HEAT FAULT	Compressor system number safety chain opened. This is the second trip.	COMP SYS # SAFETY TRIP	17, 18, 19
AUTO RESET-LOW SUCTION TEMP #	SENSOR/MISC FAULT	The suction line temperature for compressor system number dropped below the suction temperature low limit for 10 seconds.	COMP SYS # SAFETY FAULT	36, 37, 38
AUTO RESET-LPCO # TRIP 1	COOL/HEAT FAULT	The low pressure cutout circuit for compressor system number opened. This is the first trip.	COMP SYS # SAFETY TRIP	20, 21, 22
AUTO RESET-LPCO # TRIP 2	COOL/HEAT FAULT	The low pressure cutout circuit for compressor system number opened. This is the second trip.	COMP SYS # SAFETY TRIP	23, 24, 25
AUTO RESET-MSAT SENSOR	SENSOR/MISC FAULT	The mixed supply air temperature sensor is out of range for 10 seconds.	SENSOR/MISC STATUS SAFETY LOCKOUT	46
AUTO RESET-POWER FAIL	SENSOR/MISC FAULT	Main power to the unit was lost while the unit was operating.	-	47
AUTO RESET-RAT SENSOR	SENSOR/MISC FAULT	The return air temperature sensor is out of range for 10 seconds.	SENSOR/MISC STATUS SAFETY LOCKOUT	48
AUTO RESET-SOFTWARE RESET	SENSOR/MISC FAULT	The IPU controller reboots while the unit is operating.	-	45

Table 64: Auto reset

Fault text	Fault output	Description	Status screen message	Fault code
AUTO RESET-STAGED INPUT	SENSOR/MISC FAULT	The unit is controlled by staged inputs and there is a demand for cooling and heating at the same time.	SENSOR/MISC STATUS SAFETY LOCKOUT	49
AUTO RESET-SUPPLY FAN SPEED INPUT	FAN FAULT	Supply fan sync is user enabled and the speed signal from the BAS is less than 10%.	SUPPLY FAN STATUS SAFETY LOCKOUT	34
AUTO RESET-ZONE TEMP SENSOR	SENSOR/MISC FAULT	The zone temperature sensor is out of range for 10 seconds.	SENSOR/MISC STATUS SAFETY LOCKOUT	50

Table 65: Faults lockout

Fault text	Fault output	Description	Status screen message	Fault code
LOCKOUT-COMP SYS # TIME-OUT	COOL/HEAT FAULT	Either the compressor system number safety chain or LPCO circuit opened and did not reset within 60 minutes.	COMP SYS # SAFETY LOCKOUT	1, 2, 3
LOCKOUT-COMP SYS #	COOL/HEAT FAULT	Compressor system number had 3 safety chain trips within a 2 hour time period.	COMP SYS # SAFETY LOCKOUT	4, 5, 6
LOCKOUT-HGRH FAULT 1	COOL/HEAT FAULT	HGRH is inactive, compressor 2A or 2B is on, and the current SAT is greater than the current evap air temperature by 11°F (-12°C) for 15 minutes.	HRGH SYS STATUS LOCKOUT & COMP SYS #2 LOCKOUT	7
LOCKOUT-HGRH FAULT 2	COOL/HEAT FAULT	HGRH is active, the HGRH valve position is greater than 50%, and the current SAT is less than the current evap air temperature by 11°F (-12°C) for 15 minutes.	HRGH SYS STATUS LOCKOUT & COMP SYS #2 LOCKOUT	8
LOCKOUT-HIGH DUCT PRESS	FAN FAULT	The current duct static pressure exceeded the duct static overpressure setpoint.	SUPPLY SYS STATUS SAFETY LOCKOUT	31
LOCKOUT-HOT WATER FREEZE	COOL/HEAT FAULT	The HW/Steam freezestat was faulted for more than 5 minutes.	HEATING SYS STATUS SAFETY LOCKOUT	10
LOCKOUT-LPCO #	COOL/HEAT FAULT	Compressor system number had three LPCO trips within a 2 hour time period.	COMP SYS # SAFETY LOCKOUT	11, 12, 13
LOCKOUT-MANUAL STOP #	SENSOR/MISC FAULT	Compressor system number has been placed in stop mode either from the unit or from the BAS.	COMP SYS # STATUS DISABLED	38, 40, 41

Table 65: Faults lockout

Fault text	Fault output	Description	Status screen message	Fault code
LOCKOUT-MANUAL UNIT STOP	SENSOR/MISC FAULT	The control or rocker switch is turned off. There is no 24 VAC to SD terminal on CTB1. The phase monitor, if installed, is faulted. The BAS command, UNIT_STOP, has been executed.	UNIT OVERALL STATUS-LOCAL STOP	42
LOCKOUT-OAT SENSOR	SENSOR/MISC FAULT	The outside temperature sensor is out of range for 10 seconds.	SENSOR/MISC STATUS SAFETY LOCKOUT	43
LOCKOUT-RETURN FAN	FAN FAULT	The return fan status has not been proven for 30 seconds.	UNIT OVERALL STATUS-UNIT LOCKOUT	32
LOCKOUT-SAT SENSOR	SENSOR/MISC FAULT	The supply air temperature sensor is out of range for 10 seconds.	SENSOR/MISC STATUS SAFETY LOCKOUT	44
LOCKOUT-SUPPLY FAN	FAN FAULT	The supply fan status has not been proven for 45 seconds.	UNIT OVERALL STATUS-UNIT LOCKOUT	33

Multi media card

The IPU board is made up of two separate control boards, the PLUG IN I/O board and the IPU board. All the digital and analog inputs and outputs are connected to the PLUG IN I/O control. All the system logic is contained on the PLUG IN I/O board. The IPU board mounts on top of the PLUG IN I/O board and handles the communication between the PLUG IN I/O board and the User Interface. Another feature of this control system is the availability to connect a MULTI MEDIA CARD to the IPU board. The MULTI MEDIA CARD allows operational data to be continuously saved and used for the diagnosis of unit operating problems.

A MULTI MEDIA CARD is similar to a hard drive in a PC. It has a directory structure and files are saved on it. The difference between a hard drive and the MULTI MEDIA CARD is that the MULTI MEDIA CARD is made of non-volatile flash memory. This allows the MULTI MEDIA CARD to be removed from the IPU board and placed in a PC for data analysis without the lost of any data.

The MULTI MEDIA CARD is considered a Service tool and as such is controlled through the SERVICE key of the User Interface. Entry into the SERVICE screen requires a Level 2 password.

Data is continuously stored to the MULTI MEDIA CARD in root and subdirectories. The root directories are set up by month and year, under each of the root directories are subdirectories for each day. For example the data for January 11, 2005 would be stored in a root directory identified by Rm200501, the year followed by the month. The subdirectory for this day would be identified as 20050111.csv, the year followed by the month, followed by the day. Each of these files contains all the data monitored for the day specified by the file name.

All connected Analog Inputs, Analog Outputs, Digital Inputs, Digital Outputs, Serial Data and Derived Data is collected. The data is collected once every 5 seconds and stored in the same order as in the History buffer. Each line of data is timed and date stamped. Each file will include a header line detailing what data is stored in each column.

The collected data can be analyzed using a PC. The MULTI MEDIA CARD can be inserted into a MULTI MEDIA CARD reader attached to the PC. The data can be analyzed using Excel or another data analysis tool.

To install or remove the MULTI MEDIA CARD from the IPU board *DATA LOG FORMAT* must be set to off. this is done through the SERVICE screen of the User Interface. When the MULTI MEDIA CARD is installed the operation can be programmed to *UNCOMPRESSED* in which case data is recorded every 5 seconds or *SKIP UNCHANGED* which is the same as *UNCOMPRESSED* except values are only saved when they change.

If an error occurs when writing to the MULTI MEDIA CARD, *DATA LOG ERROR STATE* and *DATA LOG ERROR DETAIL* will appear under the service screen. *DATA LOG ERROR STATE* indicates what operation failed and *DATA LOG ERROR DETAIL* will give the error code from the operation. Table 66 gives a description of the *DATA LOG ERROR STATE* and Table 67 gives a description of the *DATA LOG ERROR DETAIL.*

ⓘ **Note:** The SD card cannot exceed 2 GB for data logging or software updates. Not all SD cards are compatible with the IPU system.

Table 66: Data log error state

Data log error state	An error occurred when doing this:
1	Mounting the flash card
2	Opening the root directory
3	Reading the root directory
4	Closing the root directory
5	Opening a sub-directory
6	Reading a sub-directory
7	Closing a sub-directory
8	Deleting an old directory
11	Creating a directory
14	Creating a file
15	Open a file
16	Write a file
17	Delete a file
18	Close a file

Table 67: Data log error log detail

Data log error detail	This error occurred:
1	Not permitted
2	No such entity
3	No such process
4	Operation interrupted
5	I/O error
6	Bad file handle
11	Try again later
12	Out of memory
16	Resource busy
19	No such device
20	Not a directory
21	Is a directory
22	Invalid argument
23	Too many open files in system
27	File too large
28	No space left on device
29	Illegal seek
30	Read-only file system
60	File name too long

The following factors can be used to convert from English to the most common SI Metric values.

Table 68: SI metric conversion

Measurement	Multiply english unit	By factor	To obtain metric unit
Capacity	Tons Refrigerant Effect (ton)	3.516	Kilowatts (kW)
Power	Horsepower	0.7457	Kilowatts (kW)
Flow Rate	Gallons / Minute (gpm)	0.0631	Liters / Second (l/s)
Length	Feet (ft)	0.3048	Meters (m)
	Inches (in)	25.4	Millimeters (mm)
Weight	Pounds (lbs)	0.4538	Kilograms (kg)
Velocity	Feet / Second (fps)	0.3048	Meters / Second (m/s)
Pressure Drop	Feet of Water (ft)	2.989	Kilopascals (kPa)
	Pounds / Square Inch (psi)	6.895	Kilopascals (kPa)

Temperature

To convert degrees Fahrenheit (°F) to degrees Celsius (°C), subtract 32° and multiply by 5/9 or 0.5556.

Example: (45.0 °F - 32°) x 0.5556 = 7.22 °C

To convert a temperature range (i.e., a range of 10.0 °F) from Fahrenheit to Celsius, multiply by 5/9 or 0.5556.

Example: 10.0 °F range x 0.5556 = 5.6 °C range